July 9, 1914

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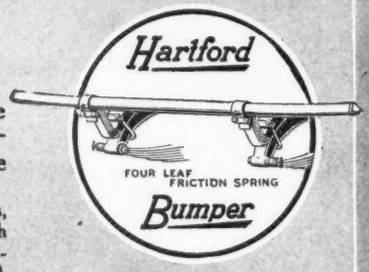

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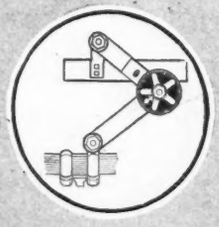

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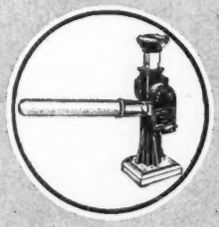

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Published by the
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910 South Michigan Avenue
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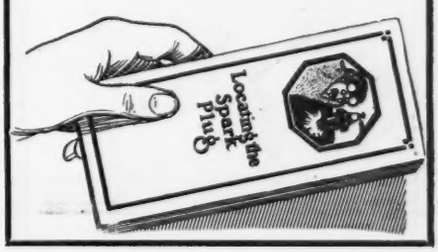

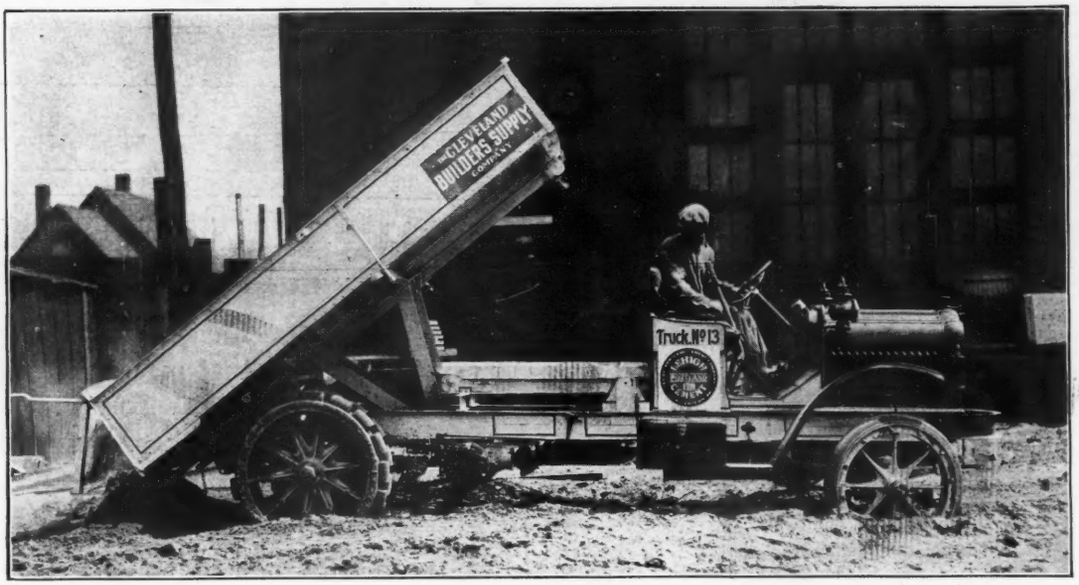

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MOTOR AGE

RICKENBACHER

LAUTENSCHLAGER

Racing Results on the Fourth

THREE important motor events were decided Saturday in this country and in Europe—the 300-mile race on the dirt track at Sioux City, Ia., and the Tacoma meet in the United States and the French grand prix in the old country.

Sioux City brought together one of the finest fields that ever has started in an American race and the meet saw the crushing defeat of six foreign cars that had helped make motor history at Indianapolis. The winner was E. V. Rickenbacher in a Duesenberg, who averaged 78.6 miles per hour, a most remarkable performance on a dirt track. The battle was a fierce one, Rickenbacher having only 48 seconds over Wishart in a Mercer. Seventeen cars started, seven actually completed the 300 miles and three others that were still running were awarded prizes.

The French grand prix produced a big surprise party, in that the French cars met with an overwhelming defeat. Germany ran one, two, three with three Mercedes, Lautenschlager, the winner, averaging 65.5 miles per hour for 467.6 miles. Goux in a Peugeot was fourth and Resta in an English Sunbeam fifth. Boillot was in second place one lap from the finish, but was put out in the final circuit by motor trouble when only a few seconds behind Lautenschlager. De Palma, the American driver, in the English Vauxhall, withdrew early and never was a factor. His car was not in shape for the race. Thirty-eight started and eleven finished. The race was for 275-inch cars and the fuel limitation was 14 miles to the gallon.

The Tacoma meet was remarkable because of the first victory ever scored by a car burning kerosene for fuel. This was Hughes' Maxwell, which won the Potlatch trophy the first day of the meet. Parsons in a Frantz took the Intercity trophy, and the big race, the Montamarathon, was won by Earl Cooper in a Stutz after a hard fight.

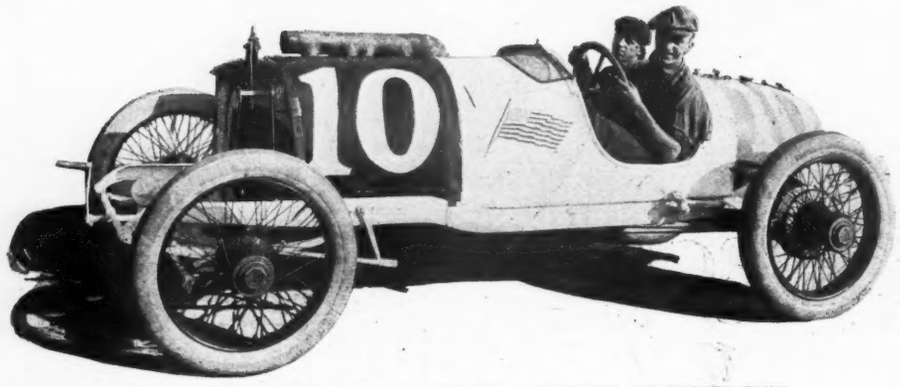
Detroit staged a cyclecar meet, which can be put down as the first real speed test of the little machines. While no remarkable time was made, still the novelty of the affair brought out big crowds, which apparently enjoyed the contests.

HUGHES

COOPER

Rickenbacher in Duesenberg

PANORAMIC VIEW OF HOMESTRETCH AT SIOUX CITY, SHOWING CROWDED GRAND STANDS AND MAIN ENTRANCE



E. V. RICKENBACHER IN DUESENBERG, WINNER AT SIOUX CITY

Finishers in Sioux City 300-Mile Race

Pos., Car and Driver	Time	M.P.H.
1—Duesenberg, Rickenbacher	3:49:02	78.6
2—Mercer, Wishart	3:49:50	78.3
3—Duesenberg, Alley-Mulford	4:02:10	74.3
4—Marmon, Patschke	4:02:56	74.2
5—Stutz, Anderson	4:03:34	73.8
6—Delage, Knipper	4:31:07	66.3
7—Gray Fox, Wilcox	4:42:32	63.8
8—Braender Bulldog, Chandler	Running at finish	
9—White, Shrunk	Running at finish	
10—Chalmers, Wetmore	Running at finish	

By C. G. Sinsabaugh

SIOUX CITY, Ia., July 6—Another Indianapolis sweepstakes, sans the European drivers but including the cars driven by the winners on Memorial day was run Saturday on the 2-mile track of the Sioux City Automobile Club and Speedway Association. The winner was E. V. Rickenbacher, who piloted No. 10 Duesenberg to a well-earned victory at the rate of 78.6 miles per hour, a most sensational performance when it is remembered that the race was run over a dirt track.

Rickenbacher was pushed to the limit by another American, Spencer Wishart, in a Mercer, and at the finish the victor only had 48 seconds to spare, rather too close for comfort but enough to clinch the long end of the $25,000 purse hung up by the Hawkeyes.

Of the twenty-two cars originally entered seventeen went to the tape, seven actually finished, while three others had a chance to finish if the officials had not decided to flag them and award them the positions they then were occupying—eighth, ninth and tenth. The seven who completed the 300 miles ran in the following order: Rickenbacher, Duesenberg; Wishart, Mercer; Alley and Mulford, Duesenberg; Patschke, Marmon; Anderson, Stutz; Knipper, Delage; Wilcox, Gray Fox. Billy Chandler in the Braender Bulldog was given eighth place for 252 miles; Shrunk in the White ninth for 196 miles and Wetmore, Chalmers, tenth for 176 miles.

Following the announcement of the officials, there was complaint made of the scoring and all day Sunday the timers and checkers were busy going over their work. They found two or three mistakes, which changed Patschke from fifth to fourth and cut down the lead Rickenbacher had over Wishart. But this did not suit the drivers and by agreement they decided to pool third, fourth and fifth money and split it three ways equally. Also on their own hook the drivers put Patschke third, Anderson fourth and the No. 12 Duesenberg fifth, but this does not correspond with the finding of the timers and checkers.

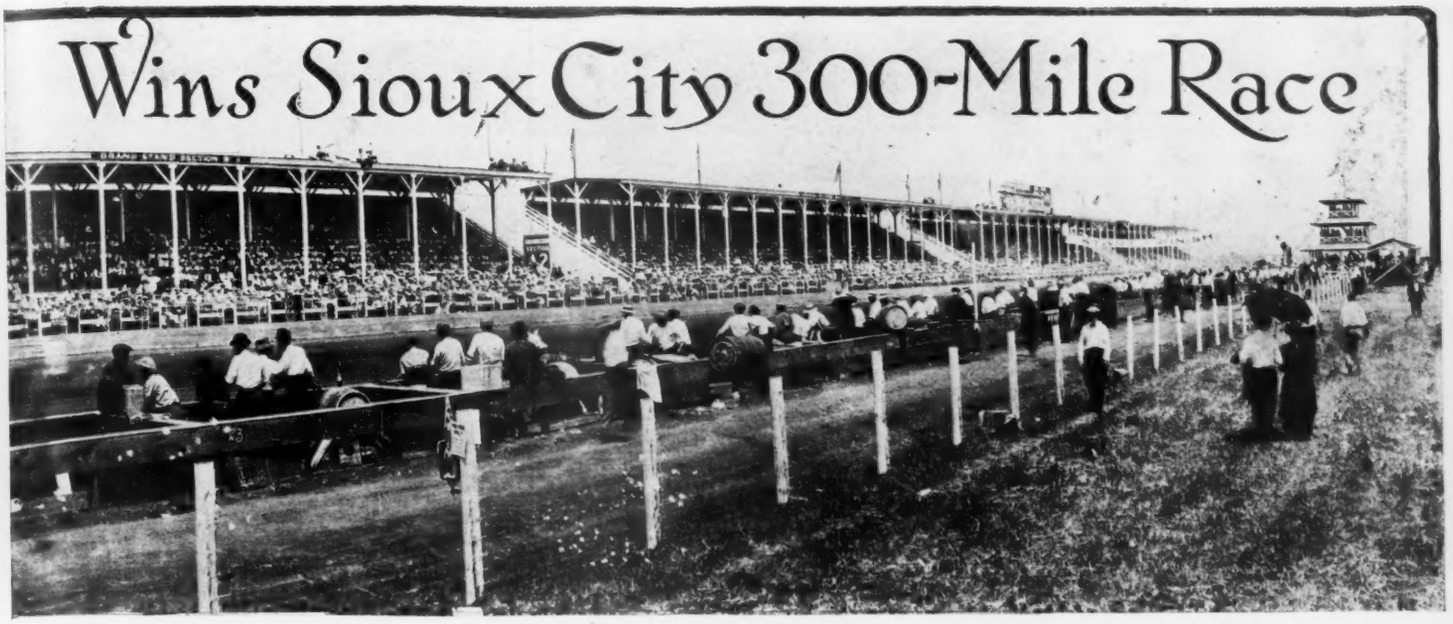
Defeat of Foreign Cars

In a way America was avenged for the Indianapolis slaughter, for of the six foreign cars that started only one finished and that only limped home with a cracked cylinder. No foreign drivers competed, however, Yankee pilots being at the wheels of the European speed marvels. The three Peugeots were driven by Burman, Mulford and Stringer; Grant and Babcock had the Sunbeams and Billy Knipper ran the Delage which was given seventh place.

It was a great race, free from accidents, well handled as a whole and a credit to the Sioux City motorists who staged it. Practically without experience in handling a meet of this size and importance, the Hawkeyes furnished a plant that speaks volumes for the possibilities of dirt speedways; they brought a crowd of about 42,000 to watch the battle and financially they drew a $92,000 gate and have a profit of about $32,000.

So encouraged are they by the results of their efforts that they have decided to have a real speedway before another year is past. They propose to either re-surface the present track or let the present gumbo

Wins Sioux City 300-Mile Race



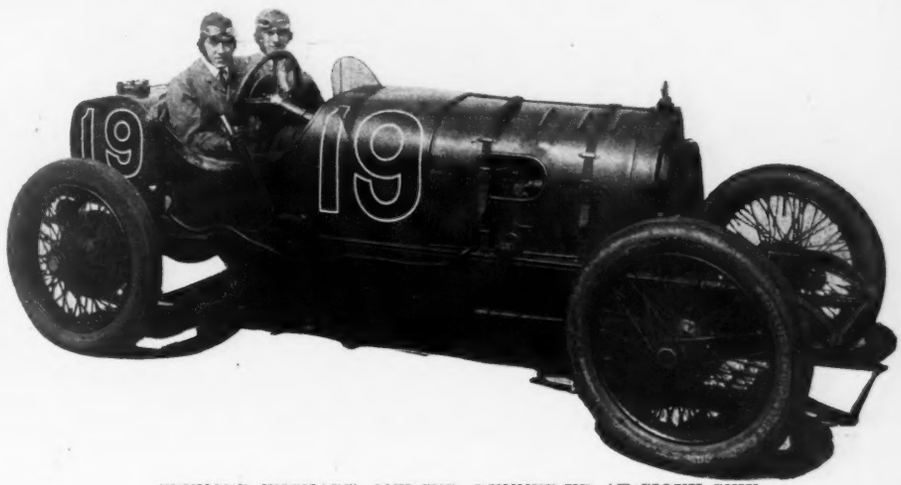
AND REAR VIEW OF PITS. THE ATTENDANCE AT THIS MEET WAS 42,000, A MOST REMARK-ABLE TURNOUT

stay and bank the turns so they will permit of greater speed. To get the flyers they intend hanging up a $50,000 purse and to retain the same day they had this year—the national holiday. At the present time they are handicapped by lack of really good transportation between the city of Sioux City and the track, which is located just over the state line in Union county, S. D.

The race started at 11 o'clock, but before that there were the usual preliminaries such as the brake test, parade of drivers, etc. There had been three cars which had failed to qualify by averaging 70 miles an hour—the two Chevrolets, and the Moon. The Metropol was out with a broken crankshaft and the Stafford with a broken crankcase. The drawing for positions resulted in the cars that did qualify lining up in rows of three each in the following order: Stutz, Anderson; Peugeot, Burman; Mason, Mason; Delage, Knipper; White, Shrunk; Mercer, Wishart; Stutz, Oldfield; Marmon, Patschke; Peugeot, Stringer; Peugeot, Mulford; Gray Fox, Wilcox; Sunbeam, Grant; Duesenberg, Rickenbacher; Duesenberg, Alley; and Sunbeam, Babcock. In the last row were Chalmers, Wetmore, and Braender Bulldog, Chandler.

Burman the Early Leader

At the outset it looked as if the race would be a runaway for Bob Burman. The American speed king in the Peugeot Jules Goux drove this year at Indianapolis, made his bid right at the outset. Being in the first row, he soon jumped away from Anderson and Mason and swung by the tape for the first time with a fairly comfortable lead. The second time around saw this increased to almost half a mile, for as he crossed the tape the closest to him was Anderson in the Stutz, who also had open up on the others, leading Wishart by a few car lengths, while trailing were Mulford,



SPENCER WISHART, MERCER, RUNNER-UP AT SIOUX CITY

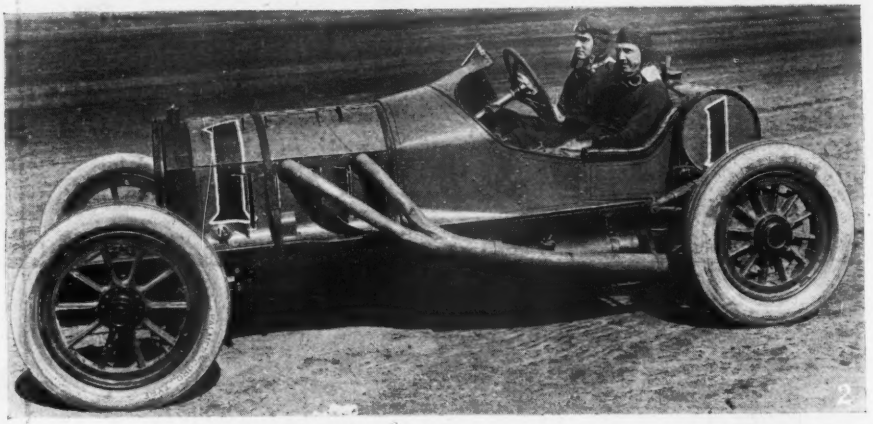
Shrunk, Oldfield, Knipper, Patschke, Stringer, Mason, Grant, Wilcox, Babcock, Alley and Chandler, strung out for a mile. At this point Mason had to stop to change a tire.

Burman, once out in front, settled down to a steady grind, while Wishart became runner-up, leading Mulford by about 100 yards. Anderson, Oldfield and Patchke were in the next group, while the others were well spread out, with Chandler bringing up the rear. Burman had the satisfaction of leading at the first 20-mile post but Wishart had been sticking to his task and he was gradually eating up the distance that separated him from Burman. The Puegeot driver apparently was not getting as much speed out of his mount as he had at the outset. It was noted that there was a miss on the Puegeot that slowed it and the Mercer took advantage of this and Wishart caught his man when Burman stopped in the thirty-second mile to change a tire and to make a carbureter adjustment.

Wishart was the leader at 40 miles with Stringer runner-up and Rickenbacker in third place. Grant was fourth and Patchke fifth. The Mercer star also led at 60 miles but Rickenbacher had gone to second and Anderson to third. There only was 17 seconds between first and second, however. At 80 miles Wishart and Rickenbacher were tied and Alley in the other Duesenberg was third, with Anderson fourth. The same order prevailed at 100 miles, with Wishart being just 1 second to the good.

Alley Out in Front

Tom Alley, who has been Ralph de Palma's mechanic for several years and who was given his first chance as a driver when No. 12 Duesenberg was turned over to him, had the joy of leading this field at 120 miles with Wishart second and Rickenbacher third. Wishart got to the front again, however, at 140 miles, with Rickenbacher still sticking to him and Alley back in third place. The next 20 miles, though, saw a general shaking up among the leaders. Knipper in the Delage who had been running fourth for 40 miles went into the lead, with Patschke second, Rick-



FINISHERS AT SIOUX CITY

From top to bottom—Tom Alley at wheel of Duesenberg, third; Cyrus Patschke in Marmon, fourth; Gil Anderson in Stutz, fifth; Billy Knipper in Delage, sixth. These six and Howard Wilcox were the only ones to complete 300 miles

enbacher third and Wishart fourth place.

At 180 miles Rickenbacher climbed out in front and once there he never relinquished his advantage. Knipper was back to second but at 200 miles Wishart had ousted him and from there on to the end it was a duel between the Rickenbacher Deusenberg and the Wishart Mercer. The two pulled away from their rivals and each was waiting for something to happen to the other fellow. Rickenbacher's knowledge of the track, where he has raced for the last 2 years, stood him in great stead and the way he took the turns picked up many seconds for him.

Hot Fight for Position

With the two leaders out of the way, the balance of the field settled down to fight for the rest of the prize money. No. 12 Duesenberg, the Anderson Stutz and the Patschke Marmon were running so closely that any one of them might have landed third, while Knipper also had a fighting chance. But the Duesenberg was the one to gain the position and back of it were the Marmon and Stutz in the order named. Knipper finished sixth, then there was a long wait until Knipper and Wilcox could finish. They were far in the rear and back of them were the White and Chalmers, all striving to finish because there were ten prizes. The officials waited on Knipper and Wilcox but the other three were so far behind that in kindness to both the drivers and the spectators the officials flagged them, the Braender having finished 126 laps, the White ninety-eight laps and the Chalmers eighty-eight.

That Rickenbacher should have won this gruelling grind is not surprising when one reviews his record. He has driven in more races on the Sioux City track than any other man; he has broken several records there, including the 50-mile mark; he had a car that is surprisingly fast and built for just this sort of work, while his knowledge of the speedway gave him a great advantage. In addition, Rickenbacher had comparatively little trouble, making only two stops in the 300 miles. His first one was at 144 miles when he lost 35 seconds changing a tire; again at 254 miles he stopped at the pits for 26 seconds while he took on gasoline and oil.

Wishart stopped longer at the pit, docking on three different occasions. The first time was at 150 miles when he used up 40 seconds taking on gasoline and oil; at 196 miles he was in for 8 minutes replacing a valve spring, and again at 274 miles it took him 50 seconds to make a tire change.

No Accidents in Race

While there were no accidents during the race, still there were several drivers injured by being struck by flying clods of dirt. It seems to be a peculiarity of this track and Referee Kneedler, realizing it, forced every driver to equip his car with a wire screen, placed at the steering wheel. Despite this precaution Patschke was struck with a flying clod, which cut him severely between the eyes. Despite the

blood that flowed, Patschke refused to give up the wheel and went on to the finish. Both Billy Knipper and his mechanic, Mercedes Fritz Wagner, were injured slightly by the clods, while Tom Rooney, mechanic for Anderson, was slightly cut when his goggles were broken by the flying dirt.

The track, though, stood up wonderfully. It had been predicted that it would be cut to pieces before 200 miles, but outside of a few rough spots on the turns it looked as good at the finish as it did at the start.

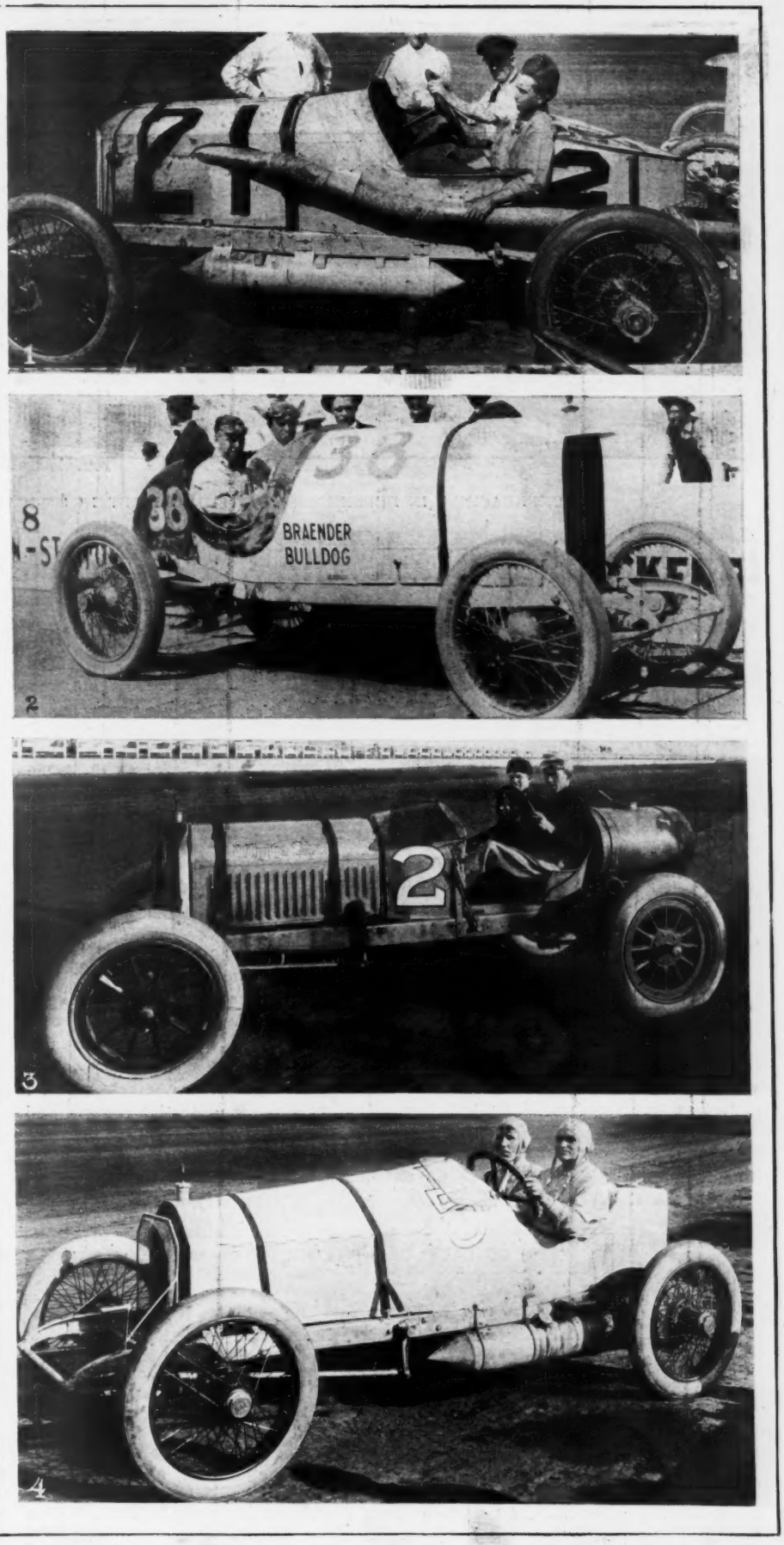
Gasoline Fire at Pits

The race was not without its thrills, however, the greatest excitement being furnished by a gasoline fire at the Duesenberg pits. Tom Alley in No. 12 had dashed up for supplies. An excited attendant splashed gasoline over the funnel while filling the tank, the spilt gasoline catching fire and igniting the contents of the can. The attendant threw the can into the pit and someone else heaved it back of the enclosure. It still was blazing and for a time it looked as if there might be trouble. Alley in his haste to get out of the car, was singed by the flames, dirt got in his eyes and he was nearly blinded.

While the fire was being extinguished No. 12 was standing in front of the pit. Ralph Mulford, who drove for Duesenberg last summer and who had been eliminated from the race when the rivets came out of the oil tank on his Puegeot, saw Alley was incapacitated and jumped into the vacant seat. He did not inform the pit attendants of his intentions and before they knew it Mulford was again in the fray and pushing No. 12 to the limit. This was at the end of the 156th mile and Mulford was allowed to go on to the end.

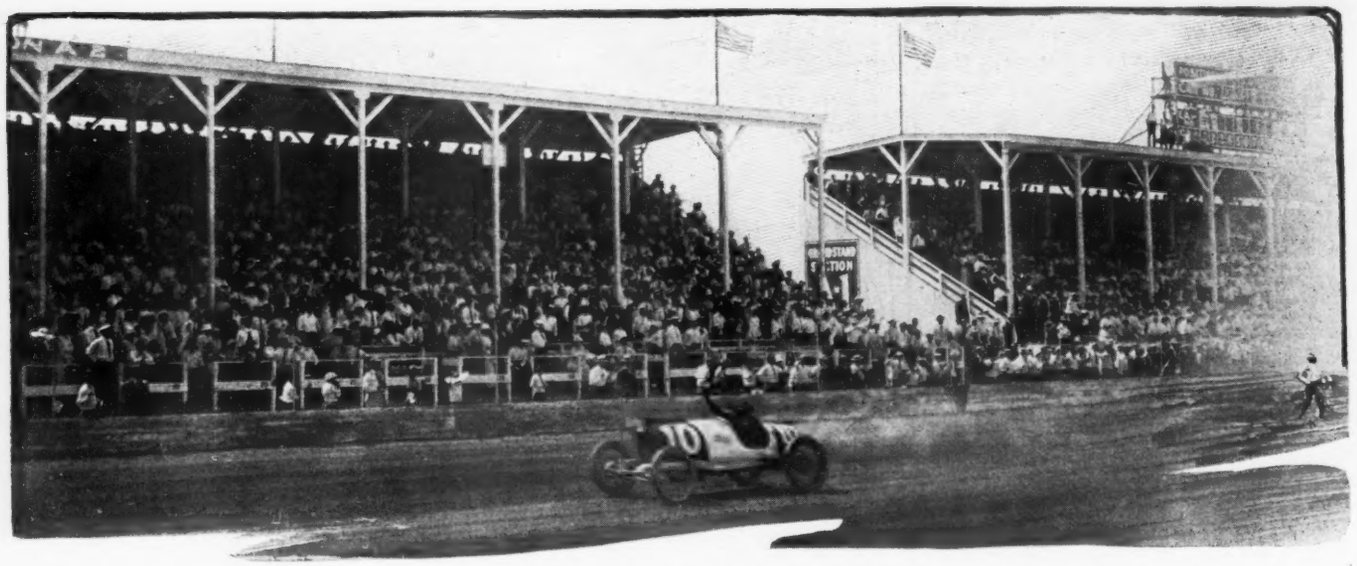
Mulford's elimination in the Puegeot came about in a peculiar way. One thing he evidently overlooked when he took over the car, which was the same Boillot had at Indianapolis, was to check up on the oil tank. Evidently the vibration at Indianapolis and Boillot's accident had loosened the rivets and when Mulford opened up in the Sioux City race these rivets, or rather some of them, rattled loose and fell inside the tank, permitting the oil to escape. Mulford stopped and soldered things up as best he could but a lap or so showed he was getting no oil. Either the solder had choked up some of the leads or the loose rivets had, for the mishap caused the docking of the Puegeot.

Another sensation was caused when Babcock in No. 12 Sunbeam passed the stand backing up. Officials and spectators gazed at the odd sight and could not understand it until Babcock stopped at the pits to take on a tire. It then developed that he had thrown a tire entering the homestretch, which had turned him around so the rear of the car was facing forward. Not daring to turn around on the track for fear of a collision with the other cars, Babcock went into reverse and backed up more than half a mile, showing great forethought on his part.



PRIZE WINNERS AT SIOUX CITY

From top to bottom—Howard Wilcox in Gray Fox, seventh; Billy Chandler, Braender Bulldog, eighth; Shrunk in White, ninth; Wetmore, Chalmers, tenth. Chandler, Shrunk and Wetmore were flagged before they could finish



RICKENBACHER, IN DUESENBERG, FINISHING FIRST IN 300-MILE RACE AT SIOUX CITY

Troubles that Made the Cars Stop at Pits at Sioux City

Mechanical Mishaps Reviewed—Tires Play Important Part in Race

By H. A. Tarantous

TIRES won the 300-mile race held at Sioux City last Saturday and the seventeen cars which competed for the prize money of $25,000 used up only twenty-one tires, amounting to much less than $1,000 in value. Eddie Rickenbacher, who won the race in a Duesenberg, stated before the race that tires alone would win the contest and although the day was exceedingly hot, Rickenbacher came through with but a single tire change, that one being his right rear tire. At the finish, the winner was only 48 seconds ahead of Wishart in a Mercer and had Rickenbacher stopped to change another casing he might have lost the race.

A very lucky happening in connection with the winner's performance is that on his last assurance lap he blew a right rear tire just as he crossed the finish line, but as the tire blew after the race had been completed the winner made the 300 miles with but one change. With much of the strain on the right tires, nearly all the cars blew the casings on the right rear wheels and of the twenty-two tires which gave way, eighteen were at the rear on the right side, two on the rear at the left side and two in front on the right side. The largest number of tires used by any one car was four.

Drivers Feared Flying Gumbo

Injuries were few and pits were well managed. The only complaint the drivers and mechanicians made was that the flying gumbo and stones, kicked up by the car ahead, cut them slightly. Patschke was cut in the forehead by a flying stone and Tom Alley, in a Duesenberg, was unable to see because dirt entered his eyes. The flying dirt and stones struck with such force that many protection screens, which were compulsory equipment, were bent. A few drivers protected the radiator by a screen, which also prevented dirt from getting to the motor.

Carbureter and valve trouble kept many of the cars in the pits for long periods and the oiling system of a few cars prevented the entries from continuing. The foreign cars especially had much mechanical trouble and all but the Delage were put out of the race by the breakage of an important part. The Delage had a cracked cylinder but continued the race, filling the water system every 3 laps to prevent overheating and consequent piston seizing. With mechanical trouble abundant with the foreign machines, and comparatively little with the Americans, who finished up front, the race may be said to show that our engineers are as capable as our brothers across the sea.

Rickenbacher stopped but 1 minute and 3 seconds throughout the entire race. He was first called to the pits after going 144 miles, when his right rear tire blew, and after running 254 miles, his pit manager thought it best to refill with gasoline and oil, so that the remainder of the race could

TIME OF EACH CAR FOR EVERY 20 MILES OF SIOUX CITY 300-MILE RACE

No.	Car	Driver	Miles / Laps	20 / 10	40 / 20	60 / 30	80 / 40	100 / 50	120 / 60	140 / 70	160 / 80	180 / 90	200 / 100	220 / 110	240 / 120	260 / 130	280 / 140	300 / 150	Miles Per Hour
10	Duesenberg	Rickenbacher		15:59	31:34	46:58	1:02:36	1:18:19	1:34:03	1:49:40	2:06:43	2:21:48	2:36:40	.....	3:02:28	3:18:45	3:33:47	3:49:02	78.6
19	Mercer	Wishart		15:22	31:09	46:41	1:02:36	1:18:18	1:33:49	1:49:20	2:07:35	2:23:09	2:38:35	.....	3:04:30	3:19:38	3:36:19	3:49:50	78.3
12	Duesenberg	Alley & Mulford		16:31	32:46	47:37	1:03:31	1:19:11	1:33:15	1:50:33	2:08:43	2:24:12	2:44:41	2:57:02	3:12:47	3:28:50	3:44:53	4:02:10	74.3
1	Marmon	Patschke		15:56	31:42	49:00	1:04:25	1:19:50	1:35:37	1:51:17	2:06:42	2:26:31	2:48:30	.....	3:08:32	3:24:57	3:44:09	4:02:56	74.2
16	Stutz	Anderson		16:19	32:48	47:33	1:03:44	1:19:40	1:35:36	1:51:41	2:07:30	2:25:40	2:47:11	.....	3:13:19	3:29:37	3:45:49	4:03:34	73.8
22	Delage	Knipper		16:14	32:23	48:14	1:04:14	1:19:57	1:35:26	1:50:53	2:06:19	2:22:00	.....	3:10:29	3:32:40	3:52:22	4:12:44	4:31:07	66.3
21	Gray Fox	Wilcox		16:23	32:19	48:10	1:05:35	1:21:18	1:51:52	2:07:46	2:23:56	2:45:12	.....	3:21:19	3:37:08	3:59:32	4:21:24	4:42:32	63.8
20	Braender	Chandler		17:11	34:19	51:25	1:09:03	2:12:19	2:21:12	3:20:46	3:37:58	3:54:48	4:48:14	Finished	126 laps,	time 4:58	:19.		
2	White	Shrunk		16:19	36:13	52:59	1:13:48	1:30:23	3:30:29	3:55:16	4:17:17	Ran 98 l	aps, time	4:58:42.					
5	Chalmers	Wetmore		18:22	39:07	1:03:08	2:05:59	2:34:05	3:28:07	4:13:06	4:39:23	Ran 88 l	aps, time	4:56:21.					
15	Sunbeam	Grant		19:25	36:00	52:32	1:09:13	1:25:49	1:42:30	1:59:06	2:17:17	2:33:06	2:44:37	3:00:00	3:17:03	3:33:51	Out, 131	laps, Bro	ken U.
14	Sunbeam	Babcock		15:20	31:38	48:03	1:04:42	1:23:13	1:39:20	1:55:54	2:11:31	2:32:43	2:44:20	Out, 108	laps, stri	pped dri	ving pini	on.	
17	Stutz	Oldfield		16:06	33:45	49:44	1:05:47	1:22:03	1:38:08	1:54:27	Out, 74 l	aps, crack	ed cylind	er.					
6	Peugeot	Burman		15:21	32:12	49:26	1:05:10	1:20:40	1:37:50	1:53:43	Out, 80 l	aps, brok	en conne	cting rod	.				
7	Peugeot	Stringer		16:27	31:18	52:43	1:09:11	Out, 44 l	aps, brok	en conne	cting rod	.							
9	Peugeot	Mulford		15:40	Out, 1	3 laps, oil	tank bro	ken.											
11	Mason	Mason		Out, 3	laps, b	roken dri	ve shaft.												

TABLE SHOWING MOTOR SIZES AND EQUIPMENT USED ON CARS IN SIOUX CITY RACE

Car	Driver	No Cyl	Bore & Stroke Inches	Disp.	Mag. & No. Dist.	Plugs Make & No.	Carburetor	Wheel-base	Gear Ratio	Tires	WHEELS		Make	Oil
											Front	Rear		
Marmon	Patschke	4	5.50x7.00	445.0	Bosch 2	Bosch 8	Schebler	120	2.6 to 1	Palmer	34x4½	34x4½	Houk	Monogram
White	Shrunk	6			Bosch 1	Bosch 6	White	112	2.75 to 1	Braender	35x5	35x5	Wood	Polarine
Chalmers	Wetmore	6	4.00x5.50	414.7	Bosch 2	Bosch 12	Rayfield	104	2.25 to 1	Michelin	32x4½	32x4½	Houk	Monogram
Peugeot	Burman	4	3.94x7.13	341.7	Bosch	Bosch 8	Master		3 to 1	Nassau	34x4½	35x5	R. W.	Castor
Peugeot	Stringer	4	4.25x7.80	442.5	Bosch	Bosch 4	Rayfield	108	2 to 1	Batavia	35x5	35x5	R. W.	Castor
Peugeot	Mulford	4	3.94x7.08	341.7	Bosch	Oleo 8	Zenith		3 to 1	Firestone, Braender, Palmer			R. W.	Castor
Duesenberg	Rickenbacher	4	4.40x6.00	360.5	Bosch	K. L. G.	Schebler	106	2.6 to 1	Riverside	33x4½	35x5	R. W.	Oilzum
Mason	Mason	4	4.4Cx6.00	360.5	Simms	Champion	Schebler	106	2.3 to 1	Riverside	33x4½	35x5	R. W.	Oilzum
Duesenberg	Alley	4	4.40x6.00	360.5	Bosch	K. L. G.	Schebler	106	2.5 to 1	Riverside	33x4½	35x5	R. W.	Oilzum
Sunbeam	Babcock	6	3.10x6.00	271.7	Bosch 2	K. L. G. 12	Schebler	116	3 to 1	Palmer	34x4½	34x4½	W. & S	Castor
Sunbeam	Grant	6	3.14x5.90	275.0	Bosch 2	K. L. G 12	Claudel	83	3 to 1	Palmer	34x4½	34x4½	W. & S.	Castor
Stutz	Anderson	4	4.80x5.75	416.2	Bosch 2	Bosch 8	Schebler			Silvertown	33x4½	33x4½	Houk	Monogram
Stutz	Oldfield	4	4.80x6.00	434.3	Bosch 2	Bosch 8	Schebler			Firestone	34x4½	35x5	Wood	Monogram
Mercer	Wishart	4	4.80x6.20	445.0	Bosch 2	Bosch 8	Rayfield	112	2.5 to 1	Palmer	35x5	35x5	R. W.	Castor
Braender	Chandler	4	4.30x6.00	350.0	Bosch 2	Bosch 8	Rayfield	105	2.3 to 1	Braender	33x4½	35x5	Dunlop	Oilzum
Gray Fox	Wilcox	4	5.00x5.50	431.9	Bosch 2	Bosch 8	Rayfield	96	2.3 to 1	Silvertown	34x4½	34x4½	R. W.	Castor
Delage	Knipper	4	4.10x7.08	380.2	Bosch 2	Bosch 8	Claudel	104	3 to 1	Firestown	34x4	35x4½	R. W.	Castor

NOTE.—All cars in the race were shaft driven. Sunbeams used wood wheels on the left side, Sankey steel wheels on right.

be continued without a stop. The filling of the tanks took 28 seconds and Rickenbacher was off never to stop until the race was ended.

Valve Spring Cost $10,000

Wishart, in a Mercer, the second man to finish, had to make three stops during the contest, two of which were for supplies while one was for mechanical trouble. After the one hundred and fiftieth mile Wishart stopped for 40 seconds to take on gasoline and oil and was off fighting for the lead, and while it looked as if Wishart was running in fine shape, he came to the pits after going 196 miles with a broken valve spring. It required 8 minutes to replace the spring.

Just as the stands decided it was a race between Wishart and Rickenbacher for first place, at about the two hundred and sixtieth mile, Wishart blew a right rear tire and came to the pits for a change. This required 50 seconds for replacement. The reason this and other tire-change times are high may be accounted for in the poor condition of the track surface, which prevented the tire jacks from getting a good hold. Very often the jacks would slip in the gumbo and many of the drivers became uneasy because of the inability of the pitmen to make quick tire changes.

Tom Alley, in Duesenberg No. 12, had a narrow escape from severe injury when he made his first stop after running 156 miles. The car was filled with water and oil and as soon as the pitman started to fill the tank with gasoline the car caught fire and a merry blaze continued for about 15 seconds. It was extinguished with three Pyrene extinguishers. The rear of the car was all ablaze and the fuel in the tank was just beginning to burn. The burning funnel and can, used in pouring, were thrown first into the pit and then outside, where the flame was extinguished quickly.

The moment the blaze was out, a roar was heard and away went Mulford in Alley's car. Mulford's original mount was put out of the race with mechanical trouble and when he heard Alley complain that he could not see because of the dirt in his eyes, he turned and without saying a word took Alley's mount. It was a good example of quick thinking and it brought both Alley and Mulford credit and money, as well.

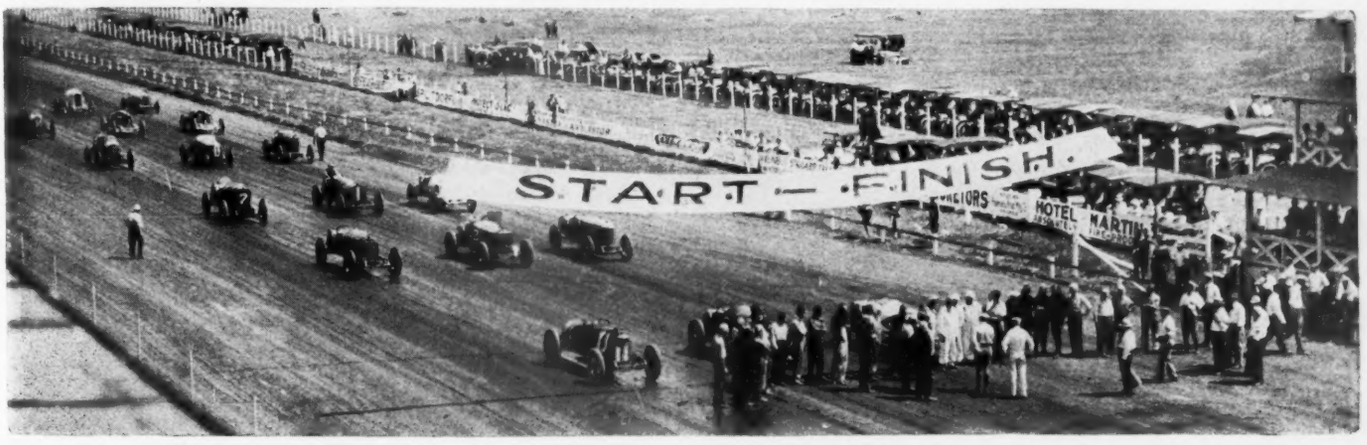
While Mulford held the wheel he made but one stop and that was in the 208th mile, when he returned to the pit for oil and water and to change a right rear tire which had blown out.

Anderson, in a Stutz, stopped a total of only 3 minutes 9 seconds through the entire race. He first was halted for gasoline and oil and the second time, after running 224 miles, to change the two right tires and take on gasoline. He had no mechanical trouble.

Four pit stops went against the Marmon, driven by Patschke, the total time lost being about 4 minutes. On his first stop, in his 12th mile, he called for oil and gasoline, and on his 178th mile for the replacement of a right rear tire. His next halt, after going 266 miles, was made for carbureter adjustment and for water, while his last stop, four laps later, was made for additional water.

Cracked Cylinder Troubled Knipper

One of the remarkable showings of the day was Billy Knipper in the French Delage, which was the same car driven by Thomas, winner of the Indianapolis race this year. Knipper made eleven stops, totaling 19 minutes 15 seconds. His trouble started after running 198 miles when cylinder No. 4 became cracked, allowing the water from the jackets to run out. The water was not pouring out and Knipper decided he could continue if he got sufficient water at frequent intervals. After changing a right rear tire and a spark



SIOUX CITY CARS LINED UP WHILE DRIVERS AND MECHANICS POSE FOR USUAL PHOTOGRAPH

plug in No. 4 cylinder, he again started, after almost 10 minutes' delay. At the 114, 222, 232, 242, 252, 260, 268, 270 and 280 mile marks Knipper had to stop to fill with water for fear of burning up the motor. It was taking a desperate chance, for had the crack enlarged it would have meant the partial destruction of the Delage engine.

Wilcox, driving the Gray Fox, took an unusual risk when he drove his last five laps without oil, not knowing that he would have finished in seventh position without any trouble had he made a short stop. This car was brought to the pits first after going 100 miles, for oil and water, and 16 miles after for gasoline, water and oil. A long stop was made at the 106th mile to change three valves and take on water and gasoline.

Push Rod Trouble on Gray Fox

Valve and push-rod trouble made the Gray Fox come to the pits three more times, and once water was taken on, but no mechanical work done. The latter stop was made after running 228 miles. A push rod broke at the end of 238 miles and valve trouble at the 260 mile mark caused another halt, this time for 4 minutes 15 seconds, while the former was for 2 minutes 22 seconds. The last stop was made also for push-rod trouble and it required 1 minute 1 second to get the rod in shape.

Five stops had to be made by Chandler in his Braender Bull Dog, the total time for them being 1 hour 39 minutes 3 seconds. The longest stop Chandler made, after completing 80 miles, was due to an oil line break and after being repaired as well as possible it gave much trouble, necessitating stops at 100, 122 and 130 miles. At each of these the line was looked over and the break sealed. At all of these stops fuel and oil was supplied, much of the latter being necessary because of the leakage through the break. The last stop, made after running 170 miles, was for 55 seconds, to change a right rear tire. Chandler was flagged by Starter Wagner after completing 252 miles.

One of the local entries, the White six, driven by Shrunk, remained at the pits for more than 2 hours during the race, the greater part of this time being consumed in repairing and replacing two bearings. The center main bearing broke and one rod bearing seized. This car had clutch trouble also toward the end of its climb to make up for lost time. This is a rare case of judgment on the part of a driver, for when Shrunk decided to fix up the motor bearings he thought of the small field remaining and expected to just keep going until only money cars were in the race. It turned out as he expected and when the race was called Shrunk received ninth money without finishing, completing only 196 miles.

Another local car which ran in hard luck was Wetmore's Chalmers six, which made thirteen stops. Most of these were for what was supposed to be carbureter trouble. The first stop, made after going 10 miles, was to change a right front tire, then at 34 miles for a right rear. The carbureter trouble began after 46 miles and it appeared that the fuel was full of water and dirt. The air line to the tank was giving trouble also. After making adjustments the car continued, but the motor still misfired badly. Two more tire changes were necessary at the end of the 64th mile, both rear tires being taken off.

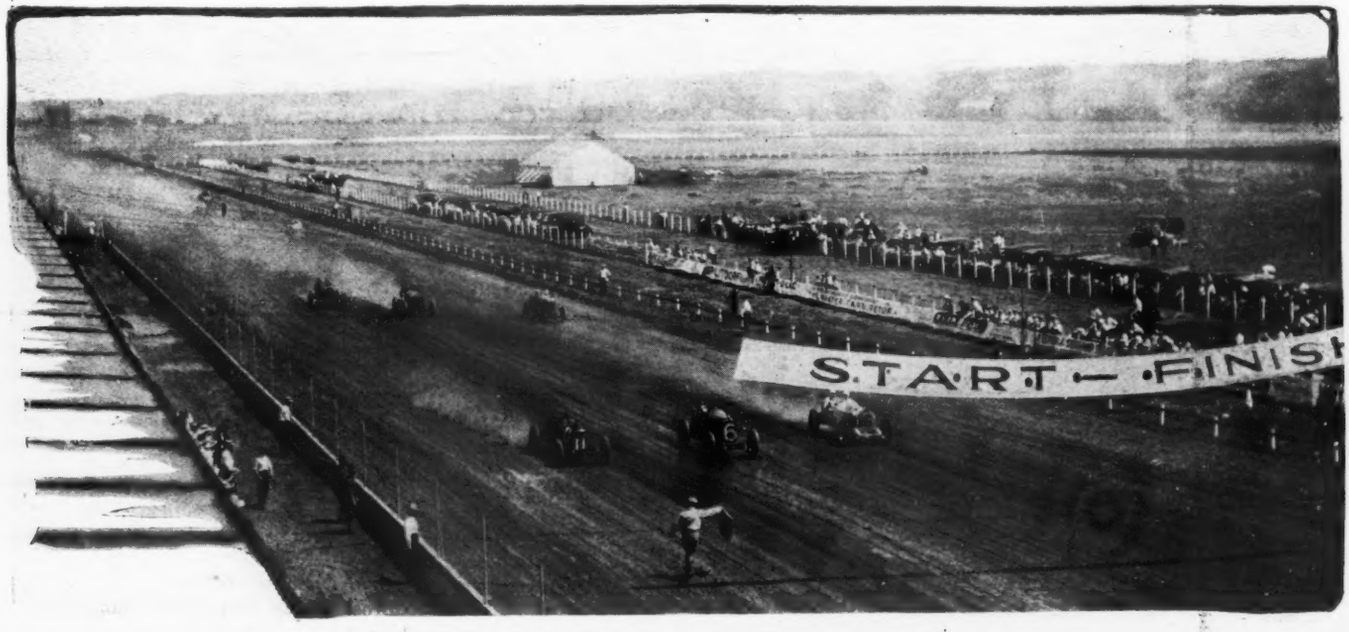
Local Entries in Hard Luck

After continuing to the 106th mile, Wetmore pulled to the pits and after considering the matter blamed the intake valve in No. 1 cylinder for the misfiring. After running a few laps the trouble again started and Wetmore came again to the pits and tried to readjust the valve, but after he ran a few more laps the motor still acted queerly. Frequent stops at intervals of about 8 miles were made and each time the carbureter was readjusted, and the valve tappets examined and the push rods reset. The motor gave considerable trouble almost until the end of its journey, which ended after 176 miles had been run, when Starter Wagner called Wetmore off the track. He received tenth prize.

One of the favorites of the day, Bob Burman, driving a Peugeot, was put out of the race after going 160 miles with a broken crankcase, connecting rod and piston, caused evidently by the seizing of a bearing. The bearing no doubt was not fed any oil, it seized, then bent the steel connecting rod which left the crankshaft and punched through the crankcase. Burman made three stops before retiring, the first one after going 32 miles, when a left rear tire was punctured. His next was in the 114th mile, for a new right rear tire and the next delay was caused by poor carbureter performance, necessitating the replacement of the needle.

Oil Tank Bursts on Peugeot

Mulford, driving another Peugeot, was in a sad plight at the end of 26 miles. He came in complaining no oil was feeding to the motor and on examination showed that the oil tank, which is under the driver's seat, had burst. It is made of brass and the sides are riveted. The rivets on the left side worked loose and permitted the oil to run out. Mulford did not delay in having the tank drained, while he prepared to solder the rivet holes. It took a little over 25 minutes to do the work, and then the pump failed to push any oil to the crankcase. A breather pipe was removed, exposing the crankcase bottom and the crankshaft and while Joe Horan, who volunteered to help Mulford, manipulated the oil pump, Mulford watched for results. He saw none, so he threw up his hand and had the car pushed off the track. Mulford



STARTER WAGNER WAVES THE RED FLAG THAT STARTS THE SIOUX CITY RACE

later jumped to the Duesenberg and brought it to third place.

Three Stops for Oldfield

The second Stutz entry, driven by Barney Oldfield, made three stops before it went out of the race with a cracked cylinder. Barney's first stop after going 144 miles, was made for oil, water and fuel. His next was in the 146th mile, when he came to the pits to clean the radiator, which was not cooling properly. He also removed No. 4 ignition wire, thereby cutting out that cylinder which contained the crack. He attempted to continue the race on three cylinders, but had to come in on the next lap. He made the conventional "I'm out" sign by throwing up his hands.

The two Sunbeams, driven by Grant and Babcock, did creditable work up to the time of their retirement. Grant made two stops for right rear tires and then, after running 262 miles, he broke a front universal while on the back stretch and he and his mechanician walked to the pits. His teammate, Babcock, made four stops. The first occurred in the 32nd mile, when a right rear tire was changed. Two other tire changes were necessary and when the last tire blew, after running 204 miles, the car turned around completely a few times, leaving the machine facing the wrong way. To prevent any accident by crossing the track he reversed for almost a mile to the pits. Here it was found the water hose to the radiator had burst and after being bound with tape the car continued only to go out with a stripped driving pinion after completing 210 miles.

The second car to retire from the race was the Peugeot, driven by Stringer. It broke a connecting rod when near the finish line while ending the 86th mile. Previous to this a stop was made after going 50 miles, for a right rear tire and considerable trouble was found in restarting.

Mason Broke Drive Shaft

The first car to leave the course was the Mason, with Mason driving. At the end of 4 miles he came in claiming no gasoline was flowing to the carbureter. He remained at the pits 30 seconds and after leaving went two miles and again came to the pits with a spark plug in No. 1 cylinder blown out. This was replaced and Mason only drove 50 feet when he broke the drive shaft and then had the car pushed off the course.

Cooper, Hughes and Parsons Winners at Tacoma Meet

Maxwell, Burning Kerosene, Captures Potlatch Trophy

By F. Kirby Haskell

TACOMA WINNERS.

Montamarathon Trophy — Earl Cooper, Stutz; 73.44 miles per hour.

Potlach Trophy—Hughie Hughes, Maxwell; 74.28 miles per hour.

Intercity Trophy—Jim Parsons, Frantz; 73.6 miles per hour.

TACOMA, Wash., July 4—Special telegram—Earl Cooper, Hughie Hughes and Jim Parsons are wearing imaginary laurel crowns tonight and have added materially to their bank accounts as a result of victories scored in the annual Montamara Festo road races held on the new Tacoma 2-mile speedway yesterday and today.

Cooper, driving a Stutz, captured the feature event of the speed carnival, the 250-mile Montamarathon race, this afternoon, duplicating his victory of last year. Hughie Hughes, with a Maxwell, took the 200-mile race for the Golden Potlatch trophy yesterday afternoon after a sensational struggle with Arthur Klein and the King, winning by the scant margin of 4 2-5 seconds. Parsons repeated his 1913 triumph in the Intercity race, driving a Frantz car to the front in yesterday morning's 100-mile curtain raiser.

Hughes Makes Fast Lap

The victory of Hughes on the first day was an epoch-making event in that the Maxwell which Hughie drove used kerosene for fuel, the first time on record that a road race has been won by a car using this method of securing its motive power. Carlson also used kerosene. Hughes made one of the fastest laps of the meet—1:25⅘ for the 2-mile circuit.

"Tetzlaff was eliminated Friday because of a connecting rod bearing going wrong, while Carlson broke a valve," said Ray Harroun, designer of the Maxwell after the meet. "Saturday Tetzlaff changed seven tires and broke a tie rod at 210 miles while running in second place and trailing Cooper. A rock pierced the radiator of Carlson's car, while Hughes had tire and valve trouble. Two of our cars were running at the end of the race."

Speed fans of the northwest turned out in throngs to witness the races. Twenty thousand people were attracted to the speedway yesterday and the holiday crowd that packed the stands today numbered 35,000.

Two accidents marred the 2 days of exciting sport. In today's race, Bert Dingley, at the wheel of the Ono, and his mechanician, Swanson, were injured when on the next to the last lap, the car plunged from the course and threw its occupants 60 feet before overturning in a ditch. Both were severely injured and it was announced tonight that Dingley is not expected to survive.

In the Potlatch trophy event of yesterday, de Alene, the Marmon driver, and his helper, Scanlon, were the victims of an accident. De Alene was leading on the seventy-third lap when his car blew a tire on the backstretch and somersaulted. Both driver and mechanician were thrown and suffered cuts and bruises. Neither was fatally injured.

Cooper Drives Consistently

Earl Cooper, the meteor of the speed constellation who in 1913 won the American road championship through his consistent driving on the coast, never shone as brightly as he did today in the race for the Montamarathon trophy. Laying back for forty-two laps, he shot the Stutz to the front after covering 84 miles and never was headed thereafter. His victory was decisive. His nearest challenger, Ruckstall in a Mercer, was six laps behind when the Stutz finished the 250-mile journey in 3 hours 24 minutes 34 4-5 seconds, an average speed of 73.44 miles per hour.

With Cooper so far in front, interest in the race centered in the battle for second place among Ruckstall, the Mercer pilot; Klein, the King driver, and Dingley, at the wheel of the Ono. Until Dingley's car was wrecked on the one hundred and twenty-fourth lap he had a slight advantage on the other two contenders as he was leading them by half a lap. With the Ono eliminated, the fight for second money narrowed down to a last lap spurt between the Mercer and King and the yellow car got the decision by 2 minutes.

Others That Finished

Two other cars of the fourteen starters finished, Parsons' Frantz capturing fourth money and Taylor's Alco being forced to take fifth place consolation honors. Smyley's Hupmobile was running when the race was called.

Six cars that were nominated failed to appear when the field was sent away at 2 o'clock—the Romano, Chalmers, P. C. Special, Hudson, Italia and de Alene Marmon. With the exception of the Marmon, which was wrecked in the Potlatch race of yesterday, no reason was given for the withdrawal of these entries.

Seven of the starters suffered mechanical trouble. All three Maxwells were eliminated before Cooper got the checkered flag, although two of them were in dangerous positions for the greater part of the race. Hughes, one of the Maxwell team, was overcome with the heat and was relieved by Carlson, who completed 103 laps before he was forced to withdraw his mount with a broken valve spring. Tetzlaff's Maxwell was a contender for ninety laps when it suffered a broken steering gear. Teddy crawled up to the pits with his mechanician, Benedict, astride the hood and holding the parts together.

Brock's Ray also looked dangerous and showed a world of speed until it was eliminated on the eighty-fourth lap with

a broken frame. The two Fiats, driven by Verbeck and Sorrell, were the first to give up the chase, Sorrell driving but three laps and Verbeck withdrawing after making thirteen circuits of the course.

Hughie Hughes was the hero of yesterday's racing. The Englishman took the Potlatch trophy by a Garrison finish and led Klein's King across the wire by only 4 2-5 seconds. The triumphant Maxwell covered the 200 miles in 2 hours 41 minutes 32 2-5 seconds and averaged 74.28 miles per hour, shattering Earl Cooper's record of 71.07 miles an hour established in the 1913 event.

Cooper a Close Third

At the finish, Cooper was almost as close to Klein as the King driver was to Hughes and was a close third. Dingley's Ono was fourth, Ruckstall's Mercer fifth and Parsons' Frantz sixth.

Until it was eliminated on the seventy-third lap, de Alene's Marmon was showing the way to the field. It went to the front at the end of the twenty-third lap and was in front for 100 miles, having an advantage of two laps when it blew a tire and rolled over in the ditch. Cooper then assumed the role of pacemaker and was not overthrown until the ninety-eighth lap when Hughes thundered by the Stutz. On the ninety-ninth lap, seconds only separated the Maxwell, Stutz and King. When almost on top of Hughes, Cooper blew a rear tire and this misfortune gave the Maxwell the race and the King second money.

Ed Pullem, winner of the 1914 grand prize, failed to finish but to him go the honors for driving the fastest lap. Pullen sent the Mercer around the 2-mile course in 1 minute 22 2-5 seconds, an average speed of 87 miles per hour.

Jim Parsons' victory in the Intercity race of yesterday morning gave him perpetual possession of the challenge trophy. Parsons drove the 100 miles in 1 hour 21 minutes 29 2-5 seconds and averaged 73.6 miles per hour for the century. Brock, in the Ray, was second, almost 10 minutes abaft the victor. Latta, driving a Lozier 100 miles without a single stop for tires or fuel, was a close third. Staley, in a Studebaker, was fourth and Croston's Chevrolet was fifth. The Chevrolet also completed the entire century without a stop. The only other car to finish was Smyley's Hupmobile, which took sixth money.

Results of the Races

The Intercity race was a battle between Parsons and Brock which reached its height on the last twenty laps. Near the finish, the Ray suffered from rear axle trouble and this probably lost Brock the race. Summaries:

INTERCITY TROPHY RACE, 100 MILES

Position	Car and Driver	Time	M.P.H.
1	Frantz, Parsons	1:21:29⅖	73.6
2	Ray, Brock	1:31:22⅖	65.72
3	Lozier, Latta	1:32:33⅕	64.8
4	Studebaker, Staley	1:39:37⅖	60.23
5	Chevrolet, Croston	.....	.....
6	Hupmobile, Smyley	.....	.....

Mercer, Thomas, out on 34th lap with burned-out main bearing.

Romano, Barnes, out on 31st lap with broken air line.

P. C. Special, Terrien, out on 13th lap, engine trouble.

Hudson, Schneider, out on 9th lap with broken crankcase.

National, McGoldrick, out on 7th lap with burned-out clutch.

POTLATCH TROPHY RACE, 200 MILES

Position	Car and Driver	Time	M.P.H.
1	Maxwell, Hughes	2:41:32⅖	74.28
2	King, Klein	2:41:36⅘	74.25
3	Stutz, Cooper	2:44:01⅖	73.26
4	Ono, Dingley	2:50:13⅗	71.81
5	Mercer, Ruckstall	.....	.....
6	Frantz, Parsons	.....	.....

Marmon, de Alene, out on 73rd lap, car wrecked.

Chalmers, Kennedy, out on 33rd lap with broken spring hanger.

Mercer, Pullen, out on 24th lap with broken rear axle shaft.

Maxwell, Tetzlaff, out on 17th lap with broken valve spring.

Ray, Brock, out on 11th lap with bent rear axle.

Maxwell, Carlson, out, engine trouble.

Fiat, Verbeck, out, engine trouble.

Italia, Welch, out with two cracked cylinders.

MONTAMARATHON TROPHY, 250 MILES

Position	Car and Driver	Time	M.P.H.
1	Stutz, Cooper	3:24:34⅘	73.44
2	Mercer, Ruckstall	3:32:33⅘	70.57
3	King, Klein	3:34:22⅕	69.89
4	Frantz, Parsons	3:45:20⅕	66.57
5	Alco, Taylor	4:17:12	64.8

Hupmobile, Smyley, running when race was called.

Ono, Dingley, out on 124th lap when car overturned.

Maxwell, Hughes-Carlson, out on 103rd lap with broken valve spring.

Maxwell, Tetzlaff, out on 90th lap with broken steering gear.

Ray, Brock, out on 84th lap with broken frame.

Mercer, Pullen, out on 27th lap with broken axle shaft.

Fiat, Verbeck, withdrew after completing 13 laps.

Fiat, Sorrell, out on 3rd lap with broken air line.

Maxwell, Carlson, out, engine trouble.

Wolverines Watch the Cyclecar Races at Detroit

Feature Event Captured by Coey of Chicago

By Marc Braun

DETROIT, Mich., July 6—The light car and cyclecar race meet that took place at the Michigan state fair grounds Saturday and Sunday was a fair success from 5,000 to 7,000 people attending the meeting each day. The races themselves were not very exciting as some were practically one-car race while others were robbed of possible interest by punctures and mechanical troubles.

All told there were thirteen races and one special match for stock touring cars during the 2 days. Harry Davison, driving a four-cylinder 18-horsepower Vixen light car, made by the Davis Mfg. Co., Milwaukee, Wis., won five events; B. Allen, driving a three-wheel English Morgan, won four events and probably would have almost cleaned up every thing had it not been for minor troubles on the first day and for the breaking of the frame on the second day after it had won the 5-mile free-for-all by over 100 yards.

Charles Coey, of Chicago, was the winner of the feature of the meeting, the 50-mile race. In fact his four-cylinder 18-horsepower Coey was one of the most consistent cars at the meeting. The little Baby Peugeot, although always running nicely, was handicapped with its small wheels—22 inches—against even less powerful cars than itself, but with 30 and 32-inch wheels. The meet was free from accidents.

The Vixen light car which won the 25-mile race covered that distance at an average speed of 53 miles an hour, which was considered an excellent performance for a dirt track.

At the exposition, which was held in connection with the races, twelve light cars and cyclecars were shown besides what is claimed to be the first cyclecar made in America, a Woods Mobilette, constructed in 1910. The concerns exhibiting were the C. J. Fischer Co., Detroit; Dodge Motor Car Co., Detroit; Twombly Car Corp., New York; Flagler Cyclecar Co., Sheboygan; Thorne Motor Co., Detroit; Koppin Motor Co., Fenton, Mich.; Woods Mobilette Co., Chicago; Valley Boat and Engine Co., Saginaw, Mich.; Princess Motor Car Co., Detroit; Detroit Axle Co., Detroit; Detroit Gear and Machine Co., Detroit; Zephyr Carbureter Co., Standard Transmission Co., Flint, Mich.

The summaries of the races of July 4 were as follows:

Five-mile, class A, stock cars—Railsback, Saginaw, by default.

Five miles, class B—Coey, Coey, won; Boglar, Malcolm, second; Clancy, Twombly, third; Robinson, Twombly, fourth. Time, 6:56⅘.

One-mile free-for-all, class A—Allen, Morgan, won; Anderson, Mercury, second; Railsback, Saginaw, third; Maloney, Beby Peugeot, fourth. Time, 1:09⅖.

Five-mile free-for-all, class A—Allen, Morgan, won; Clancy, Twombly, second; Davison, Vixen, third. Time, 6:42⅗.

One-mile free-for-all, class B—Davison, Vixen, won; Coey, Coey, second; Phelps, Zip, third; Clancy, Twombly, fourth; Carter, Browning, fifth. Time, 1:12⅕.

Five-mile stock car race—J. Boyer, Hispana-Suiza, won. Time, 5:18⅖.

Two miles, open to winners of all events—Davison, Vixen, won; Coey, Coey, second; Railsback, Saginaw, third. Time, 2:35⅘.

Twenty-five mile free-for-all—Davison, Vixen, won; Coey, Coey, second; Clancy, Twombly, third; Robinson, Twombly, fourth; Maloney, Beby Peugeot, fifth. Morgan, Zip, Downing, Malcolm and Saginaw did not finish. Time, 29:18⅕.

The summaries of the races of July 5 were as follows:

One-hour race—Coey, Coey, won; Clancy, Twombly, second; Maloney, Beby Peugeot, third; Robinson, Twombly, fourth. Distance covered by winner 50.6 miles.

Twenty-mile free-for-all—Davison, Vixen, won; Boglar, Malcolm, second; Twombly, Twombly, third; Railsback, Saginaw, fourth. Time, 23:15⅗.

Five-mile free-for-all—Allen, Morgan, won; Coey, Coey, second; Davison, Vixen, third. Boglar, Malcolm, fourth. Time, 5:54⅘.

Five-mile, stripped stock machines—Allen, Morgan, won; Railsback, Saginaw, second; Mabley, Woods Mobilette, third. Time, 6:04⅘.

Five-mile class B stripped stock cars—Davison, Vixen, won; Coey, Coey, second; Anderson, Mercury, third. Time, 5:56⅗.

Speedway 1-Mile Record Shattered

Benz Shows 128.16 m. p. h. at Brooklands

LONDON, June 24—Another world's record was shattered at Brooklands today when Hornsted, driving the venerable Benz of 84.9 horsepower rating, covered 1 mile from a flying start at a mean average of 124.10 miles per hour. The previous record was established by Victor Henry in the same car in 1909.

The official figures for today's drive under the new regulations by which a car has to be timed in both directions of the course are: Running the normal way of the track, the flying mile was covered in 28.09 seconds, a speed of 128.16 miles an hour. In traveling the reverse way the distance was covered in 29.93 seconds, a speed of 120.23 miles per hour. This gave Hornsted a mean time of 29.01 seconds and a mean average of 124.10 miles per hour. The 128.16 miles per hour mile stands as a Brooklands class record.

STARS ENTER ELGIN MEET

Chicago, July 6—The Sioux City meet was productive of twelve entries for the Elgin road races of August 21-22. Harry Stutz made two nominations for each day, with Oldfield and Anderson for drivers; the two Sunbeams are in for both days, with Grant and Babcock for pilots; E. V. Rickenbacher, winner of the 300-mile race, will drive his Duesenberg both days, while Charles Erbstein, the Chicago lawyer, names his Marmon for both events, with either Patschke or Wilcox for driver. In addition the Chicago Automobile Club had listed E. J. Schroeder's Peugeot, the one driven by Goux in last year's Indianapolis race. Schroeder has not as yet named his driver.

An extra $1,000 has been added to the prize fund, raising the total purse to $6,000. This means a $2,000 first in each race.

BUICK WINS QUAKER RUN

Philadelphia, Pa., July 3—J. S. Miller, of Chester, Pa., driving a Buick car, won the $100 cash prize offered to the driver finishing nearest the official secret time schedule in the Philadelphia Inquirer reliability run from this city to Wildwood, N. J., today. Miller's time for the trip was 4 hours 6 minutes, within 20 seconds of the official time, 4 hours, 6 minutes, 20 seconds.

Mayor Smith of Wildwood, Director of Public Safety Porter of this city, and Chief of Police Grosvenor of Camden, each specified a time in which to complete the run. These times were added together and divided by three to arrive at the average.

Second prize, $50, went to G. H. Brooks, driving an Overland, time 4 hours 7 minutes; third prize, $25, divided between LeRoy Neff, Columbia car, and E. W. Knapp, Overland, both having the same time, 4 hours, 7 minutes, 15 seconds. The winner of the fourth prize, $15, was C. S. Sale in a Cadillac, time 4 hours, 7 minutes, 30 seconds. The weather was ideal for the event and as a consequence about 100 motor cars made the trip, nearly all of which finished and complied with the necessary requirements. The start was made from the Inquirer building and the finish at the Wildwood Casino.

RESULTS AT HAWTHORNE

Chicago, July 5—Louis Disbrow and Eddie Hearne divided the honors in the dirt track speed carnival staged at the Hawthorne track yesterday and today. Yesterday Disbrow took the 10-mile free-for-all and clipped 2-5 of a second off the track record by turning a mile in the Simplex Zip in 53 1-5 seconds. He came back today and scored two victories, winning the 5-mile handicap from scratch in 5 minutes 9 seconds and the half-hour race in which he covered 29 miles.

Hearne took two events on yesterday's card, winning the 5-mile open and the 5-mile handcap races. He captured the 5-mile race today and gave Disbrow a stubborn battle in the 5-mile handicap, losing by the narrow margin of 4 feet. The 2-day meet attracted a crowd of about 5,000 daily and was run off without the semblance of an accident.

ANOTHER INTERCLUB BILLED

Milwaukee, Wis., July 4—The Milwaukee Athletic Club has accepted the challenge of the Milwaukee Automobile Club for a third reliability contest for the Wisconsin Motorist trophy on either the last Saturday in August or the first Saturday in September, and the joint contest board is preparing for a strenuous 1-day run of about 150 miles to settle the friendly grudge. The route will be 150 miles. A secret time schedule will be invoked and the mechanical penalties will be much more severe than before. A choice of observers who will not judge contesting cars on a friendship basis will be made by the contest board to avoid recurrence of the observation deficiencies of the last tour.

NEW WAY OF CELEBRATING

Louisville, Ky., July 6—On Independence day the motor car in Kentucky assumed a new role. As a reminder of what the day implies hundreds of cars throughout the state were decorated with the American flag. Owners of motor vehicles who reside in the large cities of the Bluegrass state in great numbers adopted this new method of showing their patriotism on the Fourth of July. In Louisville especially the machines flying old glory were so numerous that a really beautiful effect was produced by the fluttering pennants. The idea was suggested in the press several days before the holiday dawned. The suggestion met with instant favor throughout the state and when Independence day arrived pedestrians were surprised by the novel display of American flags on the cars.

SAXON REACHES THE COAST

Detroit, Mich., July 6—The Saxon-Lincoln highway light car reached San Francisco, Cal., July 4, on its trip across the continent over the Lincoln highway. The little car covered 3,389 miles all told, averaging 27 miles to a gallon of gasoline. H. A. Croker and Fred Wilkins, drivers of the Saxon, had previously covered 4,050 miles with the same car in a 30-day consecutive trial upon the streets of Detroit. In San Francisco the transcontinental car was given a rousing welcome.

TRACK MEET AT YORK, PA.

York, Pa., July 6—Six thousand motor enthusiasts of this city and within a radius of 50 miles from York attended the races held Saturday afternoon on the ½-mile dirt track at the York fair grounds. J. W. Richley, driving a Marquette-Buick car, owned and entered by Dr. G. Emmanuel Spotz, of this city, carried off first honors in three of the four events. The fastest time made was in a 5-mile race, for cars of less than 600 cubic inches, and was won by Richley in 6:56. Seventeen cars participated in the several events. Summaries:

Five miles, for cars of 400 cubic inches piston displacement or less—E. T. Gilliard, Chevrolet, won. Time, 7:04. Charles Lambright, Ford, second; J. W. Richley, Marquette-Buick, third; William Throne, Pullman, fourth; F. P. Molesen, Pullman, fifth; R. J. Chubb, Klinekar, sixth.

Five-mile handicap, governed by time made in previous event—J. W. Richley, Marquette-Buick, won. Time, 7:10. William Throne, Pullman, second; E. T. Gilliard, Chevrolet, third; Charles Lambright, Ford, fourth; J. P. Oden, Simplex, fifth; R. J. Chubb, Klinekar, sixth; F. P. Molesen, Pullman, seventh.

Five-mile race for cars of 600 cubic inches piston displacement and less—J. W. Richley, Marquette-Buick, won. Time, 6:56. E. T. Gilliard, Chevrolet, second; Charles Lambright, Ford, third.

Ten-mile free-for-all—J. W. Richley, Marquette-Buick, won. Time, 13:44. E. T. Gilliard, Chevrolet, second; Charles Lambright, Ford, third; J. P. Oden, Simplex, fourth.

LICENSE DRIVER, NOT CAR

New York, June 6—A new plan of the Safety First Society to insure more prudent operation has been approved by the executive committee of that society. That the driver should be licensed instead of the car is the contention of the society and it wants the law to provide that the driver's license fee be graduated in accordance with privileges granted, to correspond with the present method of graduated taxation upon the car. It also contends that it no longer is a problem of car design or car regulation, nor of regulating the gilded and irresponsible minority. The principal use of the license number at the present time is to identify the vehicle in which some offender against the law is riding and thereafter identify the offender himself.

VIEW OVERLOOKING START OF FRENCH GRAND PRIX AND SHOWING GRAND STAND IN BACKGROUND

Germans Run One, Two, Three in French Grand Prix

Lautenschlager in Mercedes Wins European Classic

FINISHERS IN THE FRENCH GRAND PRIX

Position, Car and Driver	Time	M.P.H.
1—Mercedes, Lautenschlager	7:08:18	65.50
2—Mercedes, Wagner	7:09:54	65.26
3—Mercedes, Salzer	7:13:15	64.79
4—Peugeot, Goux	7:17:47	64.08
5—Sunbeam, Resta	7:29:17	62.07
6—Nagant, Esser	7:40:28	60.93
7—Peugeot, Rigal	7:44:28	60.40
8—Delage, Duray	7:51:32	59.49
9—Schneider, Champoiseau	8:06:51	58.34
10—Opel, Joerns	8:17:09	56.43
11—Fiat, Fagnano	8:26:11	55.42

By W. F. Bradley

LYONS, France, July 4—Special cablegram—History was repeated in the French grand prix here to-day, and France exulted not in the repetition.

Three hundred thousand French sportsmen witnessed a national calamity and groaned in despair when three Mercedes cars, flying the despised colors of hated Germany, thundered over the finishing line this afternoon to take the first three places in the world's greatest speed classic.

Germany at Top of Crest

When the flag of victory—it looked as if it were made of crepe to the sorrowing crowds in the stands—waved over the hoods of the conquering mechanical triumvirate, Germany had again risen to the top of the crest, the name of Mercedes was once more foremost in the motor car world, and the speed supremacy of France, won by Boillot in the two previous grand prix races, and defended successfully at Indianapolis by Goux and Thomas, had been broken. The Mercedes victory was most decisive. The fleetest racing creations of France, England, Italy and Switzerland were forced to trail in defeat.

Lautenschlager Comes Back

Six years ago, a Teutonic Hercules, Lautenschlager, won the grand prix. France then took its defeat so to heart that the classic was abandoned and was not revived until 1912, when time had closed the gaping wound from which French pride suffered. That German giant came back today and duplicated his victory of 1908. In his triumphant drive of 467.6 miles, he humbled the stars of the French speed constellation, humbled Boillot and Goux, Bablot and Duray. In his twenty circuits of the 23.38-mile triangular course he averaged 65.5 miles per hour —a slow speed compared with the time made in the recent 500-mile race at Indianapolis, but a remarkable record when it is remembered that it was established on winding, hilly roads and in a contest in which the piston displacement of the motors was limited to 274.6 cubic inches.

Not content with first place, Mercedes took second and third. Louis Wagner, one time winner of the American grand prize, and former star of the Fiat team, trailed the winner by less than 2 minutes, while Salzer finished a third Mercedes scarcely 5 minutes astern the victorious Lautenschlager.

Goux in Fourth Place

With three Mercedes cars in front, France was forced to take fourth place as consolation honors. Jules Goux, winner of the 1913 Indianapolis sweepstakes, was the first of the French contenders to finish. His Peugeot completed its heartbreaking journey more than 9 minutes behind Lautenschlager and more than 4 minutes behind Salzer, the driver of the last of the three Mercedes.

For the second time in the history of the grand prix, an American driver, Ralph de Palma, entered the lists but the Italian failed to complete the 467.6-mile flight. De Palma was a member of the Vaux-

hall team. All three cars entered by the English company were unprepared for the gruelling struggle and dropped out early in the contest. America's lone representative was the last of the three Vauxhall drivers to give up the chase of the Mercedes and Peugeots, abandoning his car at the pits after negotiating five laps at an exasperatingly slow speed.

Boillot, teammate of Goux, and winner of the last two grand prix races, on whom France had placed every confidence, was forced out by a broken motor with only one-half a lap or 10 more miles to go. He was in second place and had been fighting a duel with the three Mercedes pilots from the opening lap. When the race was but one-quarter over, Boillot was in third place, scarcely 2 minutes back of Sailer, driving a Mercedes, and who was destined to be eliminated before the final round. Boillot went to the front on the sixth lap and held the lead from this point until the eighteenth, being pursued continually by one or two of the Mercedes. When the race was half over, he had a lead of 1 minute and 14 seconds on Lautenschlager and was ably assisted by his teammate, Goux, then running in third place and being pursued by the other Mercedes, driven by Wagner and Salzer, 2 minutes behind him.

Boillot Hero in Defeat

Although defeated, Boillot still is hailed as the pride of France as a road race driver, and the duel he fought with the Mercedes will live as a classic in road racing memoirs. From the sixth lap until his elimination in the twentieth, Boillot, a man of magnificent physique, struggled every second against the Mercedes combination.

The three Germans drove a hounding race and by sheer might wore down Boillot, who was pushed as he was never pushed before in a road race. The Mercedes drivers, with three of them running so strongly, could afford to take chances which Boillot was afraid to take. Five Mercedes started and although two, driven by Sailer and Pilette, had been eliminated, the three remaining, namely, Lautenschlager, Wagner and Salzer, were driving a hard race at the end.

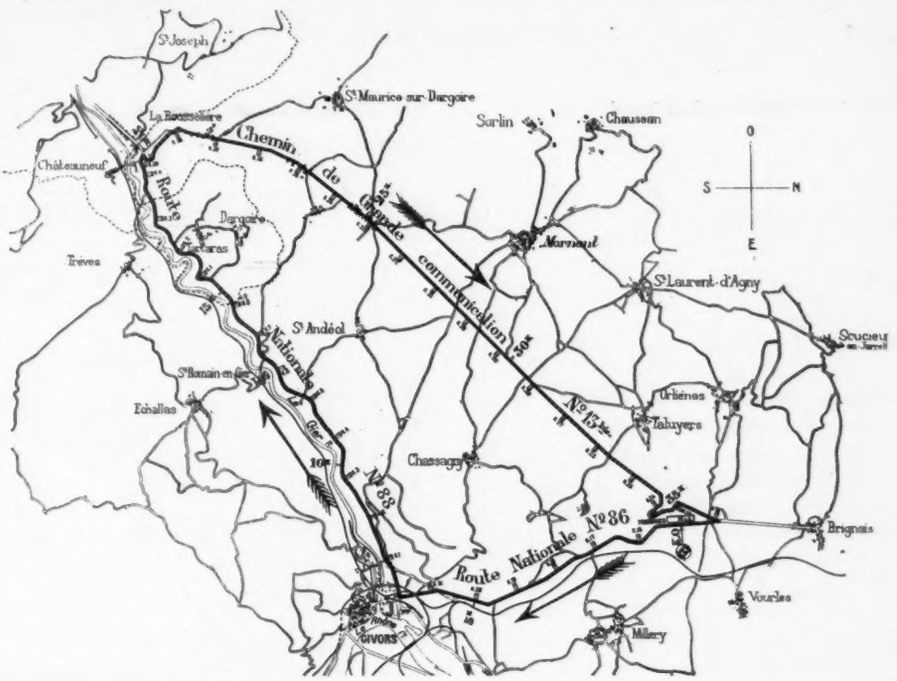
As the race progressed it could be seen that the Peugeot team was a weakening factor. Rigal, driving the third Peugeot, was nothing more or less than a steady contestant more or less from start to finish, and Goux was being gradually worked out of his position by the Mercedes runners-up.

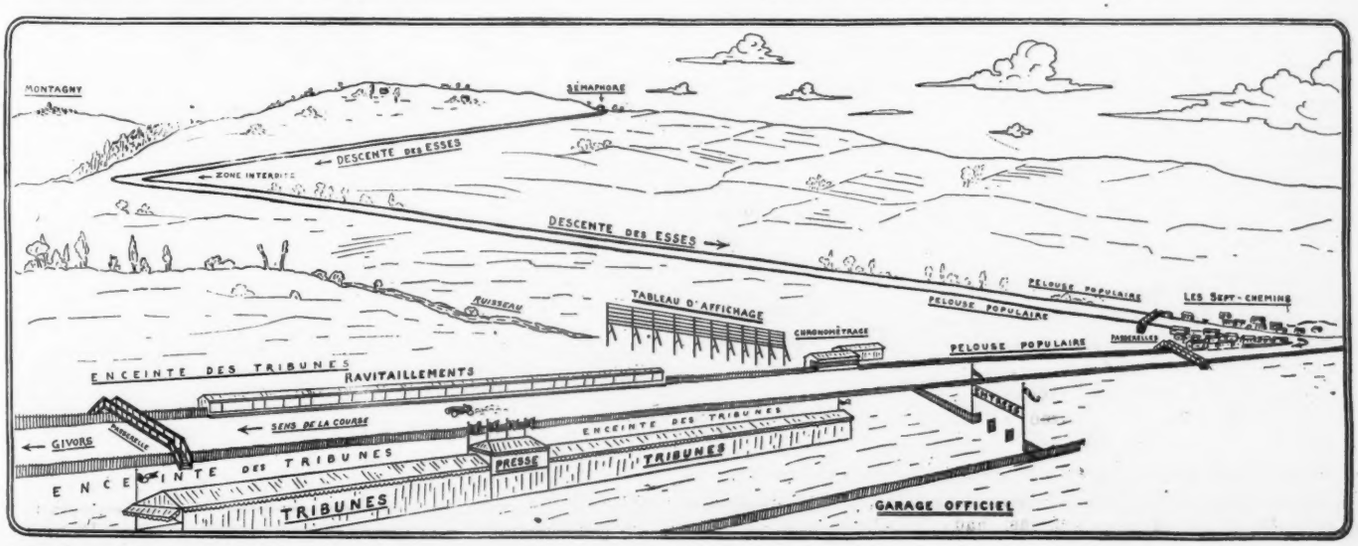
German Drivers Hound Boillot

Boillot's lead at the half-way point was but 1 minute 14 seconds, but at the thirteenth lap he had a lead of nearly 3 minutes on Lautenschlager, who had to stop for gasoline and tires. This stop delayed the German through the fourteenth lap, but his position was taken by his fellow-driver Wagner, who took second place, and a lap later, when Wagner stopped for gasoline and oil, as previously arranged for, Lautenschlager was again in second position and was soon holding Boillot even.

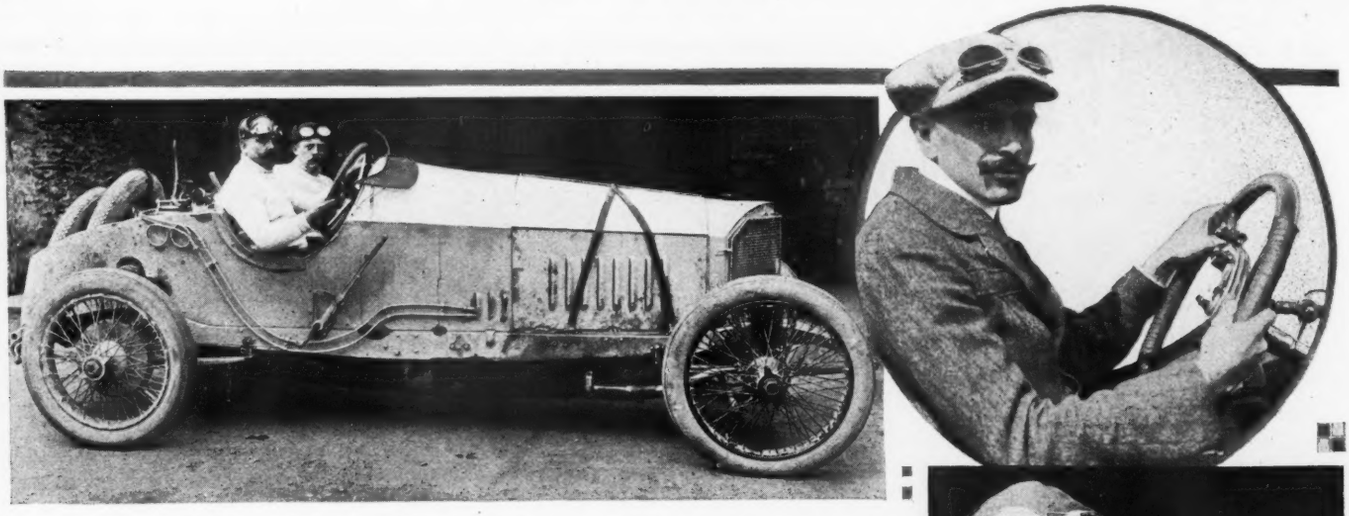
Goux Gives Victor Battle

At the fifteenth lap Lautenschlager and Goux were neck and neck on the winding descent opposite the grand stand. Goux was slightly behind, but with his front wheel brakes he could approach the bends at a higher speed than the Mercedes. At Death Corner on the course, he was afraid to take the risk. One hundred and fifty yards farther on at the second bend, he was within arm's length of Lautenschlager but again he dared not pass him. The same thing happened on the third bend of the course. Finally the two racers reached the straightaway stretch approaching Sept Chemins hairpin turn. Here Goux opened up the Peugeot to the limit and after running wheel to wheel for a few yards got ahead of Lautenschlager 20 yards before the turn was reached. Goux





UPPER ILLUSTRATION SHOWS FRENCH GRAND PRIX COURSE. LOWER ILLUSTRATION SHOWS LOCATION OF STANDS, PITS AND SCORE BOARDS



LAUTENSCHLAGER IN MERCEDES, FRENCH GRAND PRIX WINNER

thus passed in front of the grandstand a couple of seconds ahead of Lautenschlager, and although he was leading in road position, he was still behind the German on a lap time. It was not long before Lautenschlager again passed the Peugeot on the straight stretch.

Lautenschlager Takes Lead

As the seventeenth lap approached it was seen that the situation of France was becoming more and more critical, as Lautenschlager was but 14 seconds behind Boillot, the champion of France. At this point the Peugeot camp sent out an emergency call to the Peugeot drivers to drive still harder. It was without effect, for on the next lap, the eighteenth, Lautenschlager had a clear lead of 33 seconds on Boillot. Once again was the emergency signal hung out for Boillot, but he was unable to respond to it, as he was worn out by the road-driving tactics of the superior Germans and his Peugeot car was visibly failing on the nineteenth lap.

When the nineteenth lap was finished Lautenschlager had 77 seconds' lead on Boillot, and the only hope that France had was that the Germans would have tire troubles, but the tire trouble did not come. Fate was relentless and Boillot, with only a half more lap to go, and running in second place, went down and out with a motor collapse.

But little better fortune awaited Goux in the other Peugeot. On the last lap but one he lost third position to Salzer, driving the Mercedes, and finally came in fourth, exactly 9½ minutes back of the winning Lautenschlager.

That but eleven of the thirty-eight cars to start were able to finish proved the gruelling nature of the contest, which was remarkably free from accidents from start to finish, only two drivers suffering slight injuries. One of these was Szisz, familiar to American readers as having won the first French grand prix in a Renault and having competed in American grand prix races on the Savannah course in a similar make of car. Today he drove an Alda and raced in hard luck throughout. He changed a radiator early in the race and later was working on a tire by the roadside, when he was struck by one of the Opels. His shoulder was dislocated and he was generally severely bruised. The mechanician brought the car to the pits, where it remained.

Winners of the French Grand Prix

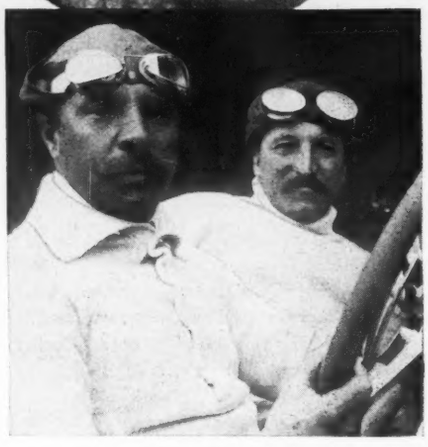
Year	Dis. miles	Car, Driver, Nation	M.P.H.
1906	774*	Renault, Szisz, France	63.35
1907	478.3	Fiat, Nazarro, Italy	70.61
1908	478	Mercedes, Lautenschlager, Germany	69.5
1912	956‡	Peugeot, Boillot, France	68.7
1913	569†	Peogeot, Boillot, France	72.03
1914	467.6	Mercedes, Lautenschlager, Germany	65.50

*Two-day race, 387 miles per day.
‡Two-day race, 478 miles per day.
†Fuel consumption race, cars limited to 1 gallon of gasoline for each 14.1 miles.

Alda Driver Overturns

Tabuteau, in another Alda, overturned on a difficult winding stretch of the road but was not severely injured. The third Alda, driven by Pietro, an amateur, made only six laps of the circuit.

England was represented by six cars, three Sunbeams and three Vauxhalls, but had only one finisher, Resta putting his Sunbeam in fifth place. The Vauxhall cars are considered the finest racing productions and represent the most up-to-date design, but they were too green for a contest of this nature. The cars and drivers were altogether unprepared for the race, and it was with difficulty that the cars were ready in time to be weighed in, and only 24 hours before the start of the race all three were completely dismounted. Ralph de Palma, the American driver and pilot of one machine, realized before starting that he had little chance of finishing. Hancock, driving one of the Vauxhalls, was more than 2 hours making the first lap, at the end of which he abandoned the hopeless task. Watson, one of the other drivers, required about the same time to complete the circuit and withdrew, leaving only de Palma, who struggled hard against fate, covering the first lap in 26:29, as compared with 21.11, the best time for the initial circuit, made by Sailer in the Mercedes. De Palma completed the second circuit in about the same time, was a little faster on the third and fourth, and after he had completed the fifth, he pushed his car off to the side of the road after passing the pits.



UPPER ILLUSTRATION, LOUIS WAGNER, SECOND TO FINISH; LOWER, SALZER, THIRD PLACE

The three Sunbeam cars made a better showing, and although Resta was only able to get fifth place, the Sunbeam was the third make of car to finish. When five laps, or the first quarter of the race, was over, Guinness, driving a Sunbeam and the winner of the recent Isle of Man road race, was in fourth position, scarcely two minutes behind Sailer, the Mercedes driver, who was leading at that point, and ahead of Lautenschlager, Goux and Wagner. Chassagne, driving another Sunbeam, was in twelfth place and Resta was further back. With the race half over, Guinness withdrew with a broken piston head, having held fourth position from the fifth lap until that time. Chassagne was forced out on the thirteenth lap, when running in seventh place, due to a broken bolt on the end of a connecting rod. The performance of Resta was a consistent one from start to finish. At the end of the first quarter he was below fifteenth place; when the race was half over he was in eighth place, and at the finish he was fifth, with his car working perfectly.

The three new Fiat cars made a favorable impression and one of them, driven by Fagnano, finished eleventh, 34 minutes back of the leader. Cagno, one of the Fiat drivers, had trouble with pre-ignition from the start of the race. This trouble also delayed Scales driving the third Fiat. Fagnano drove a consistent race and was in ninth position at the end of five laps with his team-mate Scales in eleventh place. At the half-way point, Fagnano was in seventh position.

The three Delage cars were a decided disappointment. In the trials the cars had shown themselves faster than the Peugeots and quite the equal of the Mercedes. They had been prepared with minute care. The race was scarcely started when it was seen that Bablot, one of the drivers and the most reckless of the trio, had comparatively little speed. Guyot, one of the other Delage pilots, who recently won fourth place at Indianapolis, could not make more than a commonplace showing.

Delage Makes Costly Change

Before the race all three of the Delages had experienced trouble with back-firing into the carbureters, and thinking to obviate this defect, which was supposed to arise from a slightly imperfect seating of the positively operated valves, which are opened and closed by cams, rather than the closing being effected by a spring, a new adjustment was made a few hours before the start. This proved a costly error, for immediately the speed of the motor dropped and the engine power was cut down considerably. Bablot never got better than twelfth place and Guyot once reached eighth position. Finally both Bablot and Guyot withdrew two laps before the finish of the race, rather than come in as tail-enders.

This was the first occasion in which the Delage company in a French race has failed to finish a complete team of three cars.

All of the drivers were worried before the start of the race as to whether it would be better to fit with steel studded tires or not. A heavy rain the day before the race made it doubtful with many drivers how it was best to handle the tire question. Boillot started his Peugeot with steel-studded treads and after six laps changed over to smooth treads, only to revert a little later to steel-studded ones. All changes were made with unusual speed.

On the other hand, the Mercedes team had found the right tire combination and lost no time in changing from one to the other. The heavy rain of the day previous caused general confusion and at the start at 8 o'clock this morning, road conditions were so variable that all of the drivers, with the exception of the Mercedes, were changing their tire equipment.

Cars Sent Away in Pairs

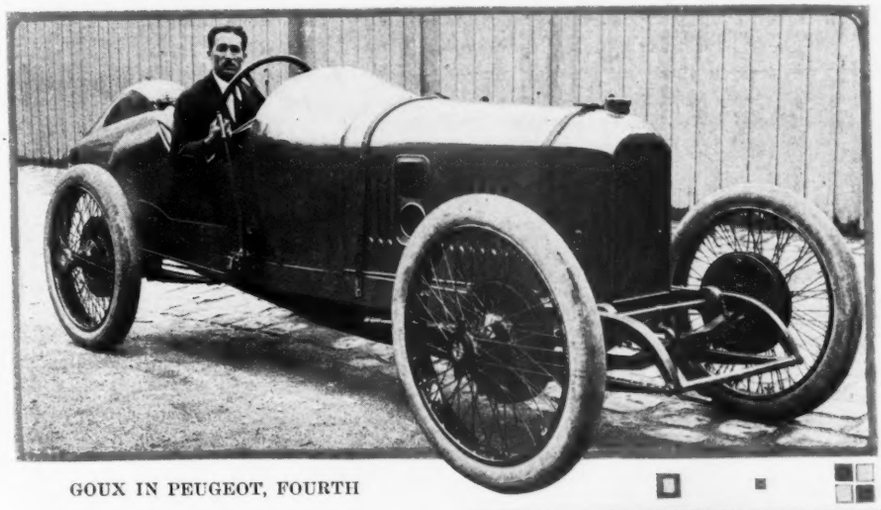
At the start a new order of procedure was made use of, and one which greatly added to the interest of this event. Instead of sending cars away singly, they were dispatched in pairs at 30-second intervals, and this method of starting gave the throngs of spectators an excellent opportunity of judging the accelerating qualities of the cars, as well as the ability of the drivers in handling the gears. Ordinarily acceleration and gear-handling are small factors, but in today's race on the 23-mile circuit, with its continuous curves, both accelerating qualities and ability to handle gears were controlling factors.

Thirty-eight of the original forty-one cars entered faced the starter. It was only 10 minutes after the last pair of cars, two Mercedes, driven by Wagner and Pilette, had been sent away that the signal was given from the top of the hill directly opposite the grandstand that the first car was approaching on the end of the first lap. Riotous tumult reigned throughout the grandstands when it was seen that Boillot in the Peugeot, who had started the same time as Champoiseau in a Schneider, was leading. During the initial lap Boillot had passed Hancock in the Vauxhall, Elskamp in a Nagant, Joerns in an Opel, and Szisz in an Alda. The grandstand had its first opportunity of judging how spectacularly located was the start and finish point. The car came in sight 3 miles from the stands and was seen coming down the winding hill, rounding the Sept Chemins hairpin turn and along the straightaway in front of the stands.

Although Boillot was the first around, the pace for the initial lap was set by Sailer in a Mercedes in 21:11, a speed of 66.3 miles per hour. Boillot was second in 21:29. This pace for the first lap gave the spectators the first intimation of what might be expected from the German combination of five Mercedes cars. All of the other entrants had three cars each, and it was easily seen that Mercedes had divided its entrants into pace-setting and position-holding departments. Sailer was out to set the breakneck pace and, if possible, lead the Peugeot drivers, Boillot and Goux, into the trap.

Duray brought his Delage in third for the first lap at 21:30, and made a spectacular showing with an American flag around his neck and carrying his Indianapolis driver's badge. The order of other finishers in the first lap were: Resta in Sunbeam, Goux in Peugeot, Pilette in Mercedes, Rigal in Peugeot, and Lautenschlager in Mercedes.

Sailer kept his Mercedes to the front in the second lap and was closely pursued by Boillot, with Duray, Resta, Goux and Lautenschlager following. This position, showing a dual among Mercedes, Peugeot, Delage and Sunbeam, continued without im-



GOUX IN PEUGEOT, FOURTH

LAUTENSCHLAGER, THE WINNER, ON ONE OF THE HAIRPIN TURNS

portant changes for the first five laps, or when the race was one-quarter over. At this point Sailer overturned his Mercedes on the La Madelein hairpin curve. Duray had the Delage in second place, closely back of Sailer, and Boillot was third in the Peugeot. With Sailer out of the running, Boillot pushed the Peugeot into the lead and Duray having to stop for tires, Lautenschlager, Goux and Wagner were in ahead of him.

Positions at end of first quarter follow:

Position Car and driver	Time
1—Mercedes, Sailer	1:44:16
2—Delage, Duray	1:45:51
3—Peugeot, Boillot	1:46:00
4—Sunbeam, Guinness	1:46:51
5—Mercedes, Lautenschlager	1:46:57
6—Sunbeam, Resta	1:46:58
7—Peugeot, Goux	1:48:10
8—Mercedes, Wagner	1:50:24
9—Fiat, Fagnano	1:50:35
10—Fiat, Scales	1:51:15
11—Delage, Guyot	1:52:09
12—Sunbeam, Chassagne	1:52:45
13—Peugeot, Rigal	1:53:07
14—Delage, Bablot	1:55:11
15—Nagant, Esser	1:56:28
16—Schneider, Champoiseau	1:59:06
17—Schneider, Gabriel	2:01:52

A few other cars were running, but were so far back as to be negligible.

The positions when the race was half completed follow:

Position Car and driver	Time
1—Peugeot, Boillot	3:30:04
2—Mercedes, Lautenschlager	3:32:18
3—Peugeot, Goux	3:35:42
4—Mercedes, Wagner	3:36:33
5—Mercedes, Salzer	3:37:37
6—Sunbeam, Resta	3:39:19
7—Fiat, Fagnano	3:42:27
8—Sunbeam, Chassagne	3:42:00
9—Delage, Guyot	3:47:18
10—Nagant, Esser	3:47:30
11—Delage, Duray	3:48:04
12—Peugeot, Rigal	3:48:40
13—Delage, Bablot	3:52:46

Felice Nazzaro, an Italian race driver well known in America from the days when he piloted Fiat cars, had three of his new Nazzaro machines entered, but none of which were ever an important factor in the race. Nazzaro, piloting one, was forced to abandon the contest early in the struggle, due to an insufficiently prepared car. Porporato, driving another Nazzaro, had various small troubles throughout the race, but was running when the race was called off and eleven cars had finished.

Brake Troubles Experienced

Switzerland was represented by two Piccard-Pictet, which are single-sleeve motors, built on the Argyll license. Each sleeve has a double movement, a reciprocating one and a part rotating one. The sleeves gave no trouble but both cars were withdrawn, due to chassis defects. Tournier, piloting one, suffered considerably with brake trouble, his differential brake seizing at the pits and having to be cooled with water and oil. The race was a gruelling one for brakes, due to the many curves, and many cars had difficulty getting away again after stopping at the pits.

Front-Wheel Brakes Make Good

Front-wheel brakes, especially designed for the race, were fitted on three makes of cars, Delage, Peugeot and Fiat, and all proved decidedly helpful. They allowed the cars to go into the turns much faster and were also advantageous on the winding portions of the course and gave Boillot a decided advantage over the Mercedes on this part of the circuit.

The management took every precaution to avoid accidents and to arrange for the safety of the drivers. There were banks of sand outside of every turn to protect the drivers in case of over-running the turns.

Grand Prix of 1914 for the Masses, Not the Classes

Lyons, Filled with Civic Pride, Makes Meet a Success

PARIS, June 24—It has taken the Automobile Club of France nearly 10 years to learn how to stage a really attractive road race. With a nervous fear of accidents to spectators, the practice in the past has been to adopt a big course removed a respectable distance from any large town. Wealthy car-owning people could always be present; the mob was barred by reason of expense. Gradually the fear of accidents has moderated, and has this year been reduced sufficiently to allow the club to select a difficult 23-mile course within a few miles of Lyons, a city with more than 500,000 inhabitants, and not far from such important centers as St. Etienne, Grenoble, Clermont-Ferrand, Le Puy, etc. The result is that 10 days before the start of the race no money could secure a box seat in the grandstands and ordinary reserved seats are as scarce as roses in November. Lyons is an important motoring center, but of all the manufacturers who clamored for the race in their neighborhood, not one has entered a car. They have contented themselves with erecting private grandstands at various points around the course and inviting their friends and customers to come there, watch the race and take lunch.

Lyons Citizens Work Hard

The city of Lyons has shown more enterprise. Its mayor is a booster of motor racing. He and his colleagues got together a subsidy of $20,000 to be offered to the Automobile Club of France towards the expense of organization and used its influence with the government departments to spend more than $30,000 in improving what were admittedly first-class roads. As a consequence the road surface doubtless is the finest over which racing cars ever have worn down tires; all possible danger points have been eliminated and two of the hairpin turns have been concreted. The third has been laid with smooth granite blocks.

Features of the Course

The course itself is of a spectacular nature. It is roughly triangular, 23.3 miles round, and has to be covered twenty times, giving a total distance of 467.5 miles. Ten miles out of Lyons, it has trolley car and train service right up to Sept Chemins hairpin turn. The grandstands are on No. 1 leg 100 or 150 yards from the turn. The situation is ideal. Opposite, and just below the level of the road, is the line of tire and gasoline pits. Half a mile across country is a hill, the winding road of which forms a part of the third leg of the course. The cars first appear in sight at the top of this hill. With the naked eye it is possible to distinguish the makes, if not the numbers, as they wind down the hillside towards the hairpin at Sept Chemins. There are four turns on this hill, two of them really difficult and calling for a low rate of travel, and two apparently easy but rather treacherous. After the fourth turn there is half a mile straightaway downhill to the hairpin turn. It is wonderful to watch the cars speed up as they strike this portion.

No. 1 leg of the course is comparatively easy. No. 2 has eighty turns in 8 miles. It is the portion of the course on which brakes have to give the best of service. Four or five of the turns look, and really are dangerous. The others are treacherous. They look innocent, but a fraction of a second's inattention would be sufficient to bring the car in contact with the wall of rock on the right-hand side, or hurl it down the embankment into the vineyards on the left.

At the end of the second leg there is a hairpin turn followed immediately by a winding climb a mile and a half long. It is followed by a perfect straightaway 7 miles long, of a switchback nature, on which speeds of 120 miles an hour should be attained. It is here that the value of a geared-up indirect drive will be appreciated. The straightaway finished, the drivers obtain a bird's-eye view of the grandstands in the valley below, and commence their winding descent. At each of the hairpin turns the approaching leg is left open, so that a driver who has miscalculated his speed can run ahead for 200 or 300 yards. Stout wood barricades are put round the course at all points where spectators are likely to gather. Barricades are also put in front of every house, even if it is an isolated one on a deserted open road.

Protecting the Drivers

As a protection to drivers, sand and cinders are banked around the outside of every turn to a height of about 3 feet. A total of 150 tons of wood, having a length of 35,000 yards is used to form barricades to keep spectators off the course. While the club has exclusive use of the roads for the day of the race, and can cause any person to be arrested if found

on it, arrangements also have been made for the rental of the land on the inside and outside of most of the turns in order to prevent spectators congregating there to their own danger. Troops, supplied by the government, are placed round the course at average intervals of 10 yards, and are reinforced by gendarmes at such places as the grandstands and the hairpin turns.

Class of the Drivers

Talent. There is a wealth of it for the great French classic. There is Sisz, who won the first grand prix race ever held in France, piloting one of Louis Renault's cars on the monotonously straight course near Le Mans. There is Nazzaro, who won the second of these contests, roaring over the finishing line in a huge Fiat in what was for a long time the world's record time. There is Lautenschlager, ever faithful to Mercedes, who in 1908 won the third grand prix. There is Albert Guyot, who first brought Delage into prominence by winning the light-car section of this same grand prix at Dieppe. There is Georges Boillot, who for 2 years in succession has carried away the honors in the world's greatest road race. There is Louis Wagner, a Vanderbilt victor and a glorious fighter in many a mighty battle of speed. There is Ralph de Palma, worthily representing America and as much a favorite among his European teammates as among those of his home country. There is Arthur Duray the joyous, who has traveled faster than any man on earth, fresh from his exploits at Indianapolis, and wearing the American flag around his neck in honor of it. There is Jules Goux, the champion of the 1912 race at Indianapolis. There is modest Jean Chassagne, the ex-sailor, who has covered a greater distance in 1 hour than any mortal being.

It is an all-star show, with talent that would cause a true American press agent to whoop and dance with delight. They take it calmly here, for it is understood that only the very best can hope to find a way onto the grand prix racing teams. It is rarely that a man who has not figured in some classic is given the wheel of a grand prix car, and of the thirty-nine to face the starter on July 4 there are only about three who have not made names for themselves.

Peugeot has Boillot, Goux and Rigal, the last named having joined the team less than a year ago. Delage has a strong company in Paul Bablot, Albert Guyot and Arthur Duray. Mercedes comes up with five men: Lautenschlager, who made his debut in France by winning the 1908 grand prix; Pilette, Mercedes agent in Brussels and driver in the 1913 Indianapolis race; Salzer, who has been in three previous French classics; Louis Wagner, a Frenchman with a German name among a group of Teutons, and finally Sailer, who comes with a reputation made in Germany.

Their neighbors, Opel, have Carl Joerns as head of the team. Joerns is as well-known as any of the Frenchmen, having been in contests innumerable for the past 10 years. His companions, Franz Breckheimer and Emile Erndtmann, are newcomers for this event. Sunbeam has put the best of the three cars in the hands of Jean Chassagne; the second goes to Kenelm Lee Guinness, fresh from his victory in the Isle of Man; Darius Resta, Italian by origin, English by adoption and training, has the third of these cars. Vauxhall, deadly rival of Sunbeam, entrusts its first car to A. J. Hancock, the second to W. Watson, both of them Englishmen, and has handed the third to Ralph de Palma, who thus makes his second appearance on a French race course.

Champoiseau, with the Schneider tag attached to him, made his reputation in a day, but he trained years for it; Gabriel is a veteran who can tell of how he won the blood-stained Paris-Madrid race for Mors 11 years ago. Juvanon is a Schneider agent; he appears for the first time.

Beria d'Argentina is the son of an Italian senator. He forms a team with Marsaglia and Constantini as drivers of the Aquila-Italiana cars. They are skilled drivers with the typical dash of the Italian; but fortune has not yet come their way. Felice Nazzaro has brought in with him Porporato and Cenisio to handle the first Nazzaro cars specially built for a grand prix. Porporato showed what he could do by taking a stock Berliet, years ago, tuning it up unaided and winning an Italian classic with it against the best European talent.

Sisz returns to the racing game after an absence of 8 years. His first and only great victory was for Louis Renault. Delaunay-Belleville got hold of him and for half a dozen years made him responsible for the tuning up of all their cars. A few months ago he broke away to establish a garage and an eleventh-hour vacancy occurring on the Alda team he accepted it. Tabuteau, ex-aviator and Alda salesman, is the second man, while the third, Pietro, is an amateur.

Fiat's team has an air of newness about it. Cagno, however, has raced all kinds of Italian cars and for a long time was a teammate with Henry Fournier. He has driven in the Vanderbilt. Scales is an Englishman trying to win his spurs. Fagnano has been given his first chance with a Fiat racing car.

Accidents in Bay State Decreasing

Massachusetts Highway Commission Reports

BOSTON, Mass., July 6—That motor accidents are decreasing in Massachusetts is apparent now from some of the records compiled by the state highway commission. Last year the legislature passed a law requiring that all accidents be reported to the commission, the penalty being a loss of license if not done. So the motorists have complied. Therefore the commission has practically a complete record covering the entire state of the various accidents.

The statistics show that during the first half of 1914 there were seventy-seven fatalities connected with motoring against seventy-two in the same period of 1913. While this is an increase of 7 per cent in deaths, yet in the same period there has been an increase of more than 20 per cent in the number of motor cars registered, making a decrease really in the death percentage.

Another comparison that shows strikingly that the tendency toward accidents of a serious nature are diminishing is that in 1913 there was an increase of more than 32 per cent in the number of fatal accidents compared with those of 1912. Of the seventy-seven deaths this year, nine were victims of motorcycle accidents.

At the office of the highway commission it is stated that although more accidents are reported, and a larger force of inspectors are detailed to investigate them, the serious ones are on the decrease. This is due to the fact that motorists are not driving at such high speed as before, and also to the fact that the commission is taking pains to impress upon the drivers that when they figure in an accident where a child is involved, the burden of being careful is placed on the motorist.

INDIANAPOLIS CHANGES

Indianapolis, Ind., July 6—A. S. Blakely, former motor editor of the Indianapolis Star, has joined the Cole family and will have charge of the factory publicity department. H. C. Bradfield, previously in charge of the department, has been promoted to field sales representative.

L. S. French has become advertising manager of the National Motor Vehicle Co., Indianapolis, succeeding P. P. Willis who resigned to accept a position with the advertising agency of Thomas Carroll Tripp, Cleveland, O. Mr. French until recently was with the Henderson.

WALPOLE RECEIVERS REPORT

Boston, Mass., July 6—The receivers of the Walpole Tire and Rubber Co. have filed their second report, showing a net profit of $83,801.03 for the 5 months ending May 31. The total earnings amounted to $112,359.64 on sales aggregating $708,486.90.

The receiver's report total assets of $406,442.94 for the Walpole Rubber Co., Ltd., of Granby, Que., and assets of $342,074.69 for the Walpole Shoe Supply Co. The latter has a surplus of $34,688.44, and the former a surplus of $27,323.05.

MOTOR AGE
Published Weekly by
THE CLASS JOURNAL COMPANY
910 South Michigan Avenue CHICAGO
NEW YORK OFFICE
239 West 39th Street
SUBSCRIPTION RATES
United States and Mexico
$3.00 per Year
Other Countries including
Canada $5.00
Entered as Second-Class Matter September 19, 1899, at the Postoffice at Chicago, Illinois, under Act of March 3, 1879
Member of the Audit Bureau of Circulations

Lessons Taught By the Grand Prix

FRANCE has gone after its road racing in a methodical manner. With it it is not a twelfth-hour pastime, but a step in the evolution of the eventual car. Nearly a year ago its makers, through the French club, decided that the race should be for cars of 4.5 liters piston displacement. This is equal to 274.6 cubic inches. It went further, declaring that the maximum permissible weight would be 2,425 pounds. It was a sensible act to put a maximum weight on the racers instead of a minimum weight as has been followed in America for so many years.

THE theories of minimum weight have been long since exploded. They are relics of the days when it was asserted that a car must have weight in order to hold the roads at high speeds. Today it has been proven that it is not weight that holds a car on the road at high speeds but rather the careful balance of the car, coupled with the elimination of vibration as well as due attention to the suspension.

FRANCE has selected the road course as the best method of testing cars that are made for racing purposes. The course was picked last fall and the cars were in several cases literally adapted to the physical characteristics of the course. In one stretch of 2 miles are eighty curves. This situation developed the necessity for extra brakes and four or more of the companies fitted brakes to the front wheels as well as to the rear ones and in addition carried another set on the gearbox. The race has demonstrated the value of front-wheel brakes which have had an uncertain value for 3 or 4 years, being used by three foreign builders and not by others, due to the extra cost of fitting them. After Saturday's race there is not any question as to the retarding effect of applying brakes on all four wheels simultaneously and the race once more demonstrated that braking on the front wheels as well as on the rear ones is a good assurance against skidding.

THAT all of the motors used the hemi-spherical combustion chamber is but another proof of the early claim of Dugald Clerk, the eminent motor authority of Europe, who proved 12 years ago the superiority of this form of combustion chamber. A year ago many of the French grand prize cars used the L and T-head types of motors, but when building for Saturday's race they frankly acknowledged that it was impossible to get the necessary motor speeds with either the L or T-head types. By using the valve-in-the-head motor design with a piston displacement of 274.6 cubic inches it has been proven that crankshaft speeds of 3,000 r. p. m. are not only possible but very practical; in fact, the crankshaft speeds of many of the cars in Saturday's race averaged over 2,700 r. p. m.

ALL Europe is today asking why some of these features of design cannot be incorporated in stock cars and claiming that if small motors can show the speed, power and reliability in a 467-mile race they should be satisfactory in regular car service. Heretofore the overhead valves with overhead camshaft have been looked at askance because of the greater noise, but Europe has compactly designed the valve-operating mechanisms and has so inclosed them with simple aluminum covers as to entirely eliminate any lubricating difficulties and also to satisfactorily muffle any noise. The abnormal height question is being gradually reduced, so that the valve-in-the-head motor is becoming a much more serious factor in design than it was a few years ago, when both Europe and America were casting it aside.

SIXTEEN valves in a four-cylinder motor, or four per cylinder, are acknowledged today as the solution of valve trouble in racing motors where high speed must be had. As to whether such would be possible in standard cars is a problem considered impossible to answer by many makers because of the added cost. But if by the addition of an extra set of valves it is possible to get improved results out of a small motor it is a point worth considering if in the long run a small motor so designed would not be a cheaper product for the owner than the larger motor with but four valves. The development of the high-speed motor is an arduous task, one not solved by imitation but one in which the company that studies and builds and races gets greatest value.

Sioux City's Accomplishment

CHANCES of breaking even were exceedingly slim, for it cost $60,000 to open the gates last Saturday and Sioux City only has a population of 60,000. If local support alone could be counted on there was little show of having the balance on the right side of the ledger. But the middle west rallied to the support of the venturesome Hawkeyes and a crowd of 42,000 filled the huge stands, the receipts totaled $92,000 and when the sun disappeared below the horizon that night the promoters found that they had made a profit of exactly $32,000.

SATISFIED that this so-called "big-league" racing is what the people want, the Hawkeyes are planning to double the purse for next year, making it $50,000, possibly increase the size of the track to 2½ miles, possibly resurface the big oval and to make it the real motor event of the national holiday of 1915. Back of them stand the loyal citizens of Sioux City, ready to support the venture and to put their city on the motor map, now that the ice has been broken.

THE object lesson taught by this success is not hard to understand. It has been demonstrated that even a small place like Sioux City can handle a meet that is second in magnitude only to Indianapolis. It has been shown that other cities can, if forced to, use a big dirt track for such an event and it has been proved that with star attractions there is no need to worry over finances. Sioux City is lucky, though, in having a peculiar soil that lends itself to track-building, which might militate against other towns not so fortunate. But it all goes to show what enthusiasm, enterprise and civic pride can accomplish when personal interests are forgotten and everybody boosts.

LAUTENSCHLAGER UND RICKENBACHER

BY J. C. BURTON

In Paris gay the Glooms hold sway,
No cock of vict'ry's crowing;
The car Delage is termed fromage,
And wine, like glue, is flowing;
Monsieur Boillot is rated slow,
No tender kiss is planted
Upon his lips, and as he sips
His absinthe, dirge is chanted.

All Germany is on a spree
And other lands is scorning;
The Teuton clan now leads the van
While France is wearing mourning:
One, two and three in the grand prix,
First also at Sioux City—
Just quaff your beer, don't shed a tear
The Dutch ask not for pity.

Great Kaiser Bill has had his fill
Of Pilsener and lager;
He loudly boasts and drinks deep toasts
In praise of Lautenschlager:
Across the sea a victory
Has led this peace-plan knocker
To plan to knight in his delight
That Deutscher, Rickenbacher.

Chicago-New York Run Made in 41:37:00 by Patterson

Amateur Tackles Non-Motor Stop Trip in Packard

NEW YORK, July 8—Special telegram—E. C. Patterson, the Chicago sportsman, reached this city last night in his non-motor stop run from Chicago, covering the distance in 41 hours 37 minutes. With a party of three in a 1913 Packard 48, he left Chicago at 3:58 a. m. Monday, July 6, and reached this city at 10:25 Tuesday night.

Mr. Patterson with an assistant drove the car in 4-hour relays. This trip was the outcome of the failure of the Chicago Automobile Club to stage its non-motor stop night and day run from Chicago to Boston, Mr. Patterson was one of the prime movers in the projected contest and when it fell by the wayside he decided to drive his own car under these conditions from Chicago to New York. He succeeded in all except that the motor stopped momentarily at Bryan, O., when filling with gasoline. Patterson had installed a small tank on the dash to supply the carbureter while the pressure was off the main gasoline tank for filling and at Bryan the auxiliary tank on the dash was turned off a second too soon. With this exception the motor was kept running from start to finish.

The speedometer showed 1,025 miles covered, the route being by way of South Bend, Toledo, Cleveland, Buffalo, Syracuse, Albany, Poughkeepsie and New York. Good weather was encountered all the way with the exception of rain from Syracuse to New York. Mr. Patterson carried two official observers appointed by the Chicago Automobile Club.

The Chicago-New York record is 29 hours 53 minutes, made in 1908 by a Franklin, driven by Carris, Bates and Talbot.

1915 NATIONAL TOUR ABANDONED

New York, July 8—Special telegram—At the midsummer meeting of the A. A. A. in session at Maplewood, N. H., it was decided to abandon the transcontinental tour terminating at the San Francisco exposition and to devote the energies of the association to routing the principal national highways and to the establishing of a rendezvous in San Francisco, Los Angeles and Seattle for individual touring members.

MICHIGAN CLAIMS DISALLOWED

Kalamazoo, Mich., July 8—At a creditors' hearing of the bankrupt Michigan Buggy Co., held in Kalamazoo yesterday, Referee in Bankruptcy W. J. Banyong disallowed $31,735 worth of claims, of which $17,735 were dealers' claims and $14,000 from purchasers of preferred stock who bought stock under the misapprehension that they would be the first to be protected in case the concern met with reverses.

BURMAN-OLDFIELD MATCH OFF

Milwaukee, Wis., July 7—The 50-mile match race between Barney Oldfield and Bob Burman, scheduled for Saturday, July 11, at the state fair mile track, Milwaukee, has been indefinitely postponed because of the accident to Burman's Peugeot in the 300-mile at Sioux City. The wager made by Oldfield and Burman was conditioned upon the use of the Blitzen Benz by the former and the Peugeot by Burman.

THOMAS WHITE'S WILL PROBATED

Cleveland, O., July 8—Special telegram—Four sons and one daughter of Thomas H. White will receive the entire proceeds of the estate of the deceased millionaire sewing machine manufacturer while they live, limited provision is made for the grandchildren and ultimately the entire estate will be devoted to the cause of education, charity and science within the city of Cleveland. The estate is placed in trust with the Cleveland Trust Co. Windsor T., Clarence G., Rollin H. and Walter C. White and Mrs. Ella White Ford are the direct immediate heirs.

Tests Demonstrate Synthetic Fuel Is a Possibility

Six-cent Gasoline Substitute Made in Garage at Speedway

By Darwin S. Hatch

INDIANAPOLIS, Ind., July 4—Making gasoline at 2 cents a gallon out of moth balls and water may seem the farthest possible remove from a sane Fourth, but that was just what was seemingly done at the speedway today. There were some other ingredients, but the white powder, napthalene, out of which moth balls are made, and river water formed the principal part of the mixture which was poured into an old soap kettle. Out of the kettle came a motor fuel, which, if it was not gasoline, had all of the properties of that popular liquid except the smell. It can be sold at 6 cents.

Story of New Fuel

John Andrews says it is gasoline, and he should know, because he is the man who invented it. John Andrews is a Portuguese-American, born on the Madeira islands, living in McKeesport, Pa., and owning allegiance to King Manuel. Formerly a sailor and then a worker in the steel mills of Pittsburgh, he selected the most dangerous work where he could get the highest pay, wherewith to carry on his experiments. Recently he received $35,000 from the United States government for the patent right to a new steel armor plate which he invented and with which the battleship Pennsylvania is being covered.

Andrews has been working on the production of synthetic gasoline for nearly 3 years, most of the time at McKeesport, until recently in a little shack at the rear of his home, when his plant blew up and destroyed his home as well. He has inlisted with him Dr. W. H. Chambers, of McKeesport, a physician and a sportsman, whose Lozier ran in the money in the 500-mile race 2 years ago. Carl Fisher's interest has been aroused in the invention, and he induced Andrews to bring the outfit to Indianapolis for a test. Upon yesterday's and today's test, then, will depend to a great extent whether Fisher and other Indianapolis capital will become financially interested. Andrew's application for patents is in, but he is guarding his secret formula jealously, and only after negotiations have reached an advanced stage will he even submit to analysis of his product.

Synthetic gasoline, that is, gasoline made by combining its elements through laboratory processes, is not unknown. It has been accomplished before, but always has cost very much more to produce than if it were distilled from crude petroleum in the usual way. It was the general impression that until the price of gasoline rose a great deal higher than its present figure, no synthetic fuel of this sort would be commercially practicable.

This impression was upset completely yesterday in the minds of a dozen engineers when there was unloaded at the speedway from the tonneau of a touring car the bottom of a base burner, an old soap kettle, a funnel-shaped hood that fitted over the kettle and some odds and ends of iron piping. The touring car with its load had just arrived from McKeesport, Pa. The whole apparatus possibly could have been purchased from any junkman for the sum of $25, but when it was set up in one of the wooden garages that housed a racing car a month ago, the junk heap assumed the form of a very complete still.

Ingredients a Mystery

The apparatus was in shape for operation in the afternoon, and into the soup kettle was poured about 15 gallons of what the inventor called "soup." This is simply the residue from two or three previous runs in McKeesport, and was used to give quick distillation. It was not gasoline, and could not have had much gasoline in it, because it could not be made to burn; nor was there any oil about it. It seemed more like dirty water than anything else. Then 5 gallons of water from the speedway mains was added, followed by about a half-cupful of some liquid and a quart of powdered naphthalene. The inventor here became quite mysterious and refused to divulge the names of the other constituents. However, he added to the mess in the kettle about 2 ounces of some clear liquid, then a half-cupful of a dark yellow liquid that made a quantity of smoke, and finished by dropping a pinch of some powder into a sort of cross between a whistle and a safety valve on the top of the gooseneck of the still.

Then a moderate fire was lit under the kettle and there was nothing to do but await results. How many of the mysterious powders and liquids that went into the kettle were necessary, and how many were put in to protect the secret, it is impossible to say. The chemicals that were added to the water are the inventor's sole secret and he may be pardoned if he goes to some lengths to preserve it.

Twenty minutes after the fire was lit, the still began to give off a great deal of inflammable gas and in just 1 hour a very light colorless liquid began to run out. This was collected in a glass water bottle of 5 gallons capacity. By the end of 2 hours more, the water bottle was full. Its contents showed a gravity of 70 degrees Baume and when poured into a special tank on a National six with a Rayfield carbureter, acted in every way the same as gasoline. It was found possible to increase the proportion of air very considerably.

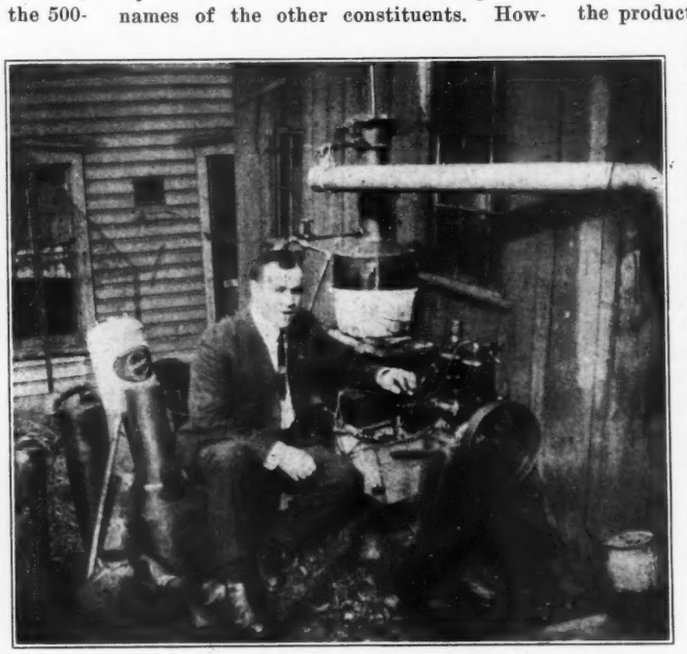
Engineers Make Tests

Today the still was put in operation again. But this time, instead of using the "soup," about 20 gallons of water was put in and a larger proportion of the chemicals. The product today had a gravity of 60 degrees Baume.

A series of exact tests were made on the product by Carl G. Fisher and a committee of engineers, including Howard Marmon, Walter Marmon and C. C. Hanch, of the Nordyke & Marmon Co., Darwin S. Hatch, of Motor Age, and others. A six-cylinder National, weighing 3,800 pounds, ran 12.5 miles on the speedway on a measured gallon of the product and showed a flexibility on high gear of between 4 and 55 miles per hour. With gasoline of 64 degree Baume gravity it showed 15.2 miles per gallon and a flexibility of between 4 and 55 miles per hour on high gear.

Similar tests on a Marmon six gave the following results: 116 miles on 9.5 gallons of the liquid, or 12.2 miles per gallon of the new fuel.

The Marmon then was run 100 miles on the new fuel and at the end the valves showed no appreciable carbonization.



John Andrews and his home-made still at McKeesport, Pa., with engine on which first tests were made

With the availability as a fuel of this product, this synthetic gasoline, seemingly proven, the only doubtful point is the cost of manufacture. According to Andrews, it can be turned out at a cost of 2 cents a gallon. His word has to be taken on this point as he will not divulge the kind or nature of some of the chemicals employed, nor will he permit analysis of the product to be made at this time. The chief ingredients are napthalene and water, neither of which are expensive. Andrews states that all of the materials may be obtained anywhere. As for fuel, the 5 gallons turned out yesterday required three lumps of soft coal, each no larger than a man's head, and four packing boxes split up for wood.

One of the features of the process is the fact that the gravity of the product can be made whatever desired, simply by altering the proportions of the chemicals. That is, Andrews can obtain at will gasoline of any gravity test between 50 and 90 degrees Baume. At present he cannot hit the desired gravity test by a few degrees on account of the crude apparatus and seemingly haphazard way in which he guesses at the quantity of ingredients.

May Have Great Possibilities

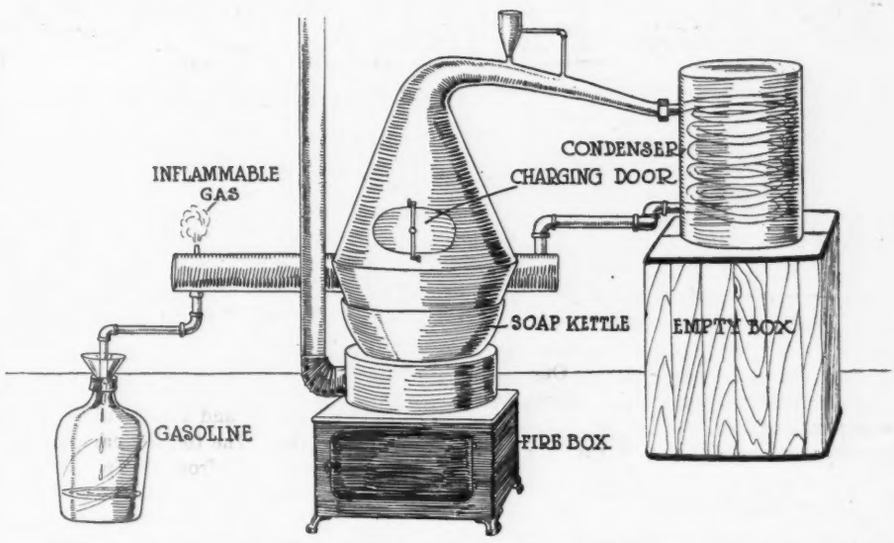
Andrews seems to have the germ of a wonderful idea, one which may have endless possibilities. If he has succeeded in breaking up water and other substances and combining them again into a hydrocarbon at a commercially practical cost in the crude apparatus and with the unscientific methods he now uses, there is no foretelling what modern equipment and careful handling might accomplish. Even with the present arrangement there are at least two by-products which might be utilized. One is the quantity of gas given off at the beginning of the run, and the other is the scrapings from the still which Andrews says he has found makes a cheap explosive.

If Andrews' cost figures are correct, and he is not blown to atoms before he tells the formula, cheap gasoline is more than a probability.

Results of Later Tests

Indianapolis, Ind., July 6—Tests on the new fuel discovered by John Andrews, which is being demonstrated at the speedway, were continued today and gave even better results than the earlier ones. In the same National six which was used July 3 and 4, and with the same driver, Norman Gilman, a foreman for the National Motor Vehicle Co., at the wheel, the car averaged 17.75 miles per gallon on the new fuel, and 17.5 miles per gallon on gasoline. A six-cylinder Cole showed 12.9 miles per gallon of gasoline and 13.5 miles per gallon of the new fuel. There was no perceptible smoke.

The test was first made with gasoline of a specific gravity of 64. The gasoline tank was then drained and filled with the new liquid of 60 gravity. Apparently the same results were obtained as with gasoline. There seemed to be no difference in efficiency and speed.



Still set up in one of the speedway garages. It resembles a cannon stove with the upper part a boiler. Connected with this is a large metal pipe leading to a coil condenser in a drum and from the drum is another pipe through which the fluid runs into the bottle

Speaking of the new liquid, Carl G. Fisher said:

"It may be worthless as a marketable product, and again it may be something that will revolutionize the motor car industry. There is no doubt about it being a wonderful discovery for the reason that it shows an explosive power equal to that of gasoline. The whole thing simmers down to the question of production cost. Andrews has given us figures showing that it can be made at a low figure and can be marketed at 5 or 6 cents a gallon. He claims that every ingredient can be purchased at any drug store and that two or three can be obtained at any grocery. If that proves true, then Andrews has solved the fuel question for gasoline engines.

"However, there may be some ingredients in the mixture that would boom in price if a big demand were made by reason of manufacturing for the market. These tests are not only to determine what it will cost to operate a machine. We know that. We want to know what effect it has on engines. Andrews claims there is little if any carbon resulting from its use, and there is little if any smoke from it. As I said, the whole thing may fizzle out, but we want to know. That is the reason we have arranged to have several chemists present, not only from Indianapolis, but from other points."

To Systematize Motor Car Insurance

NEW YORK, July 6—The motor car insurance of the United States is to be centralized and systematized in so far as the adjustment of losses is concerned; data as to every chauffeur and as to car owners applying for insurance is to be compiled and classified; recovery of stolen cars is to be made the work of a nation-wide bureau, all of which are the objects of the Manufacturers and Dealers Motor Underwriters, Inc., in a proposed plan which has been adopted, following alterations in its policy.

Originally it was proposed that the company represent two of the large insurance companies and make motor car dealers its agents, permitting the dealer to sell insurance and providing that repairs covered by insurance be made by the dealer in the car damaged, regardless of what city the dealer be located in.

Under the new plan the company will write no insurance at all, will appoint no agents but transforms itself into a service bureau. A rule will forbid anyone connected with the company from assisting in the securing or placing of any insurance and it will act impartially toward all.

The motor car service and inspection bureau has been formed theoretically as a department of the business but in reality all the company's business will be transacted by this bureau. In fact, the company name may later be relegated to the background and the name of the bureau brought forward as the name of the business.

It has been proposed that this service or bureau be supported by the various companies making use of it, through a subscription based on a percentage of their premium income in motor car insurance. The service rendered to a company with $1,000,000 premium income would be twice as great and twice as expensive as the service rendered a company with but $500,000 premium income.

In brief, it is the purpose of the bureau to reduce the loss ratio of the insurance companies to a minimum.

Mechanical Features of the French Grand Prix Cars

Small Motors Develop High Rate of Speed

PARIS, June 24—Restricted to a cylinder area of 4½ liters, or 274.6 cubic inches, and forbidden to exceed 2,425 pounds total weight, fourteen European makers have entered forty-one cars in the French grand prix at Lyons. There will be thirty-nine starters, for Caesar, one of the Italian firms, has made it known that its cars will not be at the starting line.

When the race was announced under the new limited bore rules, there was considerable hesitancy among the European makers; the race appeared in danger of suppression for lack of support. Suddenly interest revived and the big total of forty-one cars was obtained. For the first time since France has held grand prix races, the event really is international. France does not predominate—at any rate numerically; it has four firms and twelve cars. Italy has four firms and eleven cars. Germany brings forward eight cars belonging to two firms. England has also two firms with six cars; Switzerland and Belgium have each one firm with two cars.

Features of the Cars

Examined technically, there are many interesting characteristics about the set of cars prepared for the Fourth of July race. Restricted only in the matter of cylinder area, all the makers but one have preferred a four-cylinder motor and with only one exception the cylinders are a block casting. Aquila-Italiana is the solitary six-cylinder exponent, and Mercedes is distinctive by preferring separate steel cylinders to a block casting. It is an open secret that Mercedes built two sets of cars, one with six-cylinder motors and the other with four-cylinder, and after prolonged road tests decided to run with the fours.

The hemispheric type of combustion chamber with overhead valves and overhead valve-operating gear is found on every car in the race. Parenthetically, it may be explained that Piccard-Pictet is running with a single-sleeve valve motor, built under the Argyll and Piccard-Pictet patent. The firm's interests, however, are bound up in this type of motor, consequently in this case there has never been any competition between the overhead and the L or T type motor. Firms which a year ago raced with the L or T type, thus claiming that there was a certain similarity between their racing and their stock machines, have been obliged to come out boldly for the overhead-valve type. Examples are Sunbeam, Vauxhall and Alda. With liberty to build any type motor within the piston displacement, all the makers have preferred the long-stroke type. Vauxhall and Fiat have a stroke bore ratio of 1.4 to 1; all the others have a ratio of practically 1.7 to 1. Peugeot has the most extreme type with 1.83 to 1.

On motors of this type there really are no unimportant features; yet valves and valve-operating mechanisms may be picked out as having received the closest attention. It was obvious that pioneer work would have to be done in this direction in view of the ever-increasing motor speeds. The average engine speed of the grand prix cars may be put down at 2,600 to 2,700 revolutions. Not a few of the motors run at 3,000 and slightly over, and it is quite the exception to find motors designed to run below 2,500 revolutions.

Results of High Speeds

These high speeds have caused prolific trouble to develop with valves and valve-operating gear. Either valves would refuse to operate correctly above a certain speed, or the heavy springs employed to secure a quick return of the valve to its seat "chewed up" the cam. The type of valve-operating gear with which Peugeot was first so successful has found a considerable following. This provides practically a direct-operating cam. There are two camshafts, each one in an independent aluminum housing, and the two driven by a train of spur pinions. The cam operates in what may be termed a stirrup having a couple of projections received in guides. The lower of these two projecting pieces is in direct contact with the valve stem. This piece is unusually light, and is the only intermediary between the cam and the valve. This type of gear is maintained by Peugeot with only slight modifications on last year's design. It also has been adopted, in general design if not in detail, by Sunbeam, Vauxhall and Nagant.

The latest type of gear is that abolishing valve springs entirely, the valves being positively opened and positively closed. Delage has been the first if not to design, at any rate to obtain a practical application of the positively closed valve. Schneider has a design of a somewhat similar nature. It is to be noted that sixteen valves are to be found on all but two makes of cars. Exact valve diameters are not obtainable, at any rate for publication. It is known, however, that in

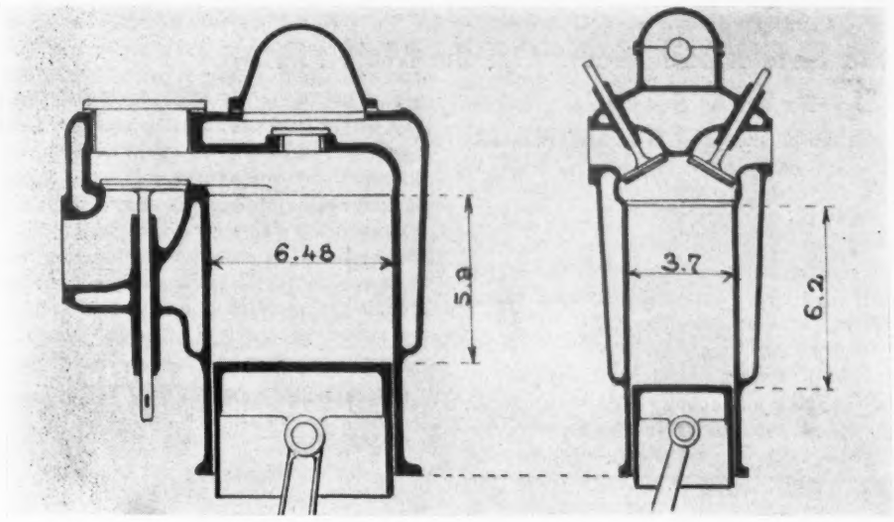
TABLE GIVING SPECIFICATIONS AND MECHANICAL

MAKE	No.	Drivers	Cylinders	Bore and Stroke, Inches	Displacement, Cu. Inches	Valves	Main Bearings
ALDA (France)	1 15 29	Tabuteau Pietro Sisz	4	3.7x6.3	271	16 overhead one camshaft..	5 plain
DELAGE (France)	9 23 35	Guyot Bablot Duray	4	3.7x6.3	271	16 overhead two camshafts	5 ball
PEUGEOT (France)	5 19 32	Boillot Goux Rigal	4	3.6x6.7	274	16 overhead two camshafts	3 ball
TH. SCHNEIDER (France)	6 20 33	Champoiseau Gabriel Juvanon	4	3.7x6.3	271	16 overhead one camshaft..	3 roller
SUNBEAM (England)	10 24 36	Chassagne Lee Guinness Resta	4	3.7x6.3	271	16 overhead two camshafts	3 ball
VAUXHALL (England)	4 18 31	Hancock W. Watson DePalma	4	3.97x5.5	274	16 overhead two camshafts	5 plain
AQUILA-ITALIANA (Italy)	12 26 37	d'Argentinia Marsaglia Constantini	6	3.3x5.1	262	12 including overhead..	3 ball
FIAT (Italy)	13 27 38	Cagno Fagnano Scales	4	3.9x5.6	268	8 overhead one camshaft..	5 plain
NAZZARO (Italy)	8 22 34	Nazzaro Porporato Cenisio	4	3.7x6.3	271	16 overhead one camshaft..	3 ball
PICCARD—(Pictet) (Switzerland)	11 25	Tournier T. Clarke	4	3.8x5.9	268	Single sleeve	5 plain
NAGANT (Belgium)	3 17	Elskamp Esser	4	3.7x6.2	267	16 overhead two camshafts	3 ball
MERCEDES (Germany)	14 28 39 40 41	Lautenschlager Pilette Salzer Sailer Wagner	4	3.66x6.5	274	16 overhead one camshaft..	5 plain
OPEL (Germany)	2 16 30	Carl Joerns Erndtmann Berckheimer	4	3.7x6.3	271	16 overhead one camshaft..	5 plain

NOTE.—Rudge-Whitworth wire wheels on all. All block motors except Mercedes, which have separately cast steel cylinders. All use pump-cooling and all are shaft-driven with differential.

several of the best cars they vary between 1.7 and 1.8 inches.

Valve timing also is a matter on which exact information is not readily obtainable. The following may be taken as approximately that of some of the most efficient motors: Intake opening, 12 degrees after center; intake closing, 45 degrees after center; exhaust opening, 45 degrees before center; exhaust closing, 18 degrees after center.



CONTRASTING THE FIRST AND LAST GRAND PRIX

The above illustration gives an idea of the difference in piston displacement of the first grand prix of 1906 and that of 1914. To the left is the 1906 race, which had a piston displacement limit of 778 cubic inches, the motor developing 105 horsepower at 1,200 r. p. m. and being capable of a speed of 90 miles an hour. To the right is shown the 1914 motor with a piston displacement limit of 274 cubic inches, with the motor showing 130 horsepower at 3,000 revolutions and capable of 108 miles per hour. The drawing is to scale and the measurements in inches

FEATURES OF CARS IN THE FRENCH GRAND PRIX

Oiling	Ignition	Carbureter	Clutch	Gears	Drive taken Through	Brakes	Wheelbase, Track, Inches	Tires
Variable splash	Bosch double	Claudel	Cone with raybestos	4; direct on third	Central tube	Rear wheels	106 53	Pirelli 34x4 34x4½
Centrifugal circulating	Bosch single	Claudel	Multi disk	5; direct on third	Springs	Front wheel Rear wheels	106 53	Pirelli 34x4½ 35x5
Pump circulating	Bosch single	Zenith	Leather cone	4; direct on fourth	Springs	Front wheel Rear wheels	106 53	Dunlop 34x4 34x4½
Centrifugal circulating	Bosch single	Claudel	Cone	4; direct on fourth	Torque member	Rear wheel	110 54	Dunlop 34x3½ 34x4½
Pump circulating	Bosch single	Claudel	Cone	4; direct on fourth	Springs	Rear wheel	106 53	Dunlop 34x4½ 34x4½
Pressure	High-tension	Zenith	Cone	4; direct on fourth	Tube and spherical joint	Rear wheel	111 54	34x4½ 34x4½
Pressure	Bosch single	Zenith	Multi disk	4; direct on fourth	Central tube	Rear wheels	106 56	Pirelli 34x4 34x4½
Pressure	Bosch double	Fiat	Multi disk	4; direct on fourth	Springs	Front wheel Rear wheel	110 52	Pirelli 34x4 34x4½
Pressure	Bosch double	Zenith	Dry disks	4; direct on fourth	Central tube	Double on rear	107 54	Pirelli 34x4 34x4½
Pressure	Bosch single	Zenith	Disk	4; direct on fourth	Springs	Front wheel Rear wheel	104 52	Continental 34x4 34x4½
Centrifugal circulating	Bosch single	Nagant	Disks	5; direct on fourth	Springs	Rear wheel	110 53	Dunlop 34x4½ 34x4½
Circulating	Two Bosch doubles 4 plugs per cyl	Mercedes	Cone	4; direct on fourth	Tube torque members	Rear wheel	111 53	Continental 34x4½ 35x5
Pressure	Bosch single	Opel	Cone	4; direct on fourth	Springs	Rear wheels	118 53	Continental 32x4 34x4½

Six makers employ ball bearings for the crankshaft, the same number have plain bearings, and one firm employs roller bearings. A lot of work has been done with regard to the details of lubrication. There is a tendency towards the use of the system by which all oil is pumped out of the base chamber, being delivered to the bearings from a tank set somewhere in the frame, thus isolated from the heat of the motor, and returned to this tank as soon as it works out of the bearings. Single and double high-tension magnetos are about equally employed. By double ignition is meant a magneto firing two plugs simultaneously in one cylinder. Mercedes has gone further in this respect by having two double magnetos, thus igniting four plugs simultaneously.

Water circulation is by pump in every case. Some of the firms specialize on thermo-syphon cooling for their stock cars, but find it necessary to fit a pump for their racing productions. Two firms carry the radiator on the dash in their stock productions, but fit it in front for the speed merchants, while maintaining the same external form as if the cooling water was at the rear of the engine.

The nature of the course is alone sufficient to impose a four-speed gearbox. Because of the peculiar nature of the set of roads, this question of gear ratio is one which has had to be worked out with the most minute care. There are some straightaway stretches of a switchback nature where the limit of speed is the ability of the car to hold to the road. Because of this several makers are using a geared-up fourth gear, with direct drive on third. Delage makes use of five gears, direct drive being obtained on third, and fourth and fifth being geared up. Nagant also has five speeds, but gets direct drive on fourth and is only geared up on fifth for this race.

Every Car Shaft-Driven

Every car in the race is shaft-driven, and all have bevel-type rear axle. The system under which the springs are relied on to take the drive and the torque has a slight numerical advantage over all other systems combined. Brakes have had to receive unusually close attention because of the winding nature of the road. These special conditions are responsible for Delage, Peugeot, Piccard-Pictet and Fiat fitting brakes to the front and rear wheels as well as to the transmission. Where the usual type of brake is employed the area is made unusually large and careful provision is allowed for adjusting the brakes while the car is in motion, which should help the drivers.

Every car in the race has wire wheels, which would indicate that this type of wheel is not only faster than any other, but gives the greatest factor of safety.

Routes and Touring Information

Kindling a Flame to Lure Motor Moths Off the Main Highway

[By Frank Farrington

WHEN Denver succeeded in getting that loop put into the Lincoln highway, giving the tourist an optional route which would include that city, though adding many miles to the distance, it only did what any city or town ought to do when located off from the main motor thoroughfare of its section.

We all cannot be on the main traveled roads. Many a town which has attractions superior to those of others of its section of country will find itself to one side of the trunk lines because of the necessity for following the shortest and best routes as indicated by the topography of the country.

Unless such towns are satisfied to take what little touring business comes their way and to entertain the few motorists who are not adhering to trunk line travel, they will be continually disgruntled over the fact that they do not seem to be on the motor map.

But the town that has attractions of its own for the tourist need not stand still and with folded hands let the current of travel pass by on the other side.

One of the first things the town must do to help bring tourists out of their way to it is to see that it is connected with the trunk line by a good road. Preferably, there ought to be two roads so the tourist can come in on one and go out on the other, making the town the farthest point on a loop, rather than the tip of a spur. Such travelers do not like to double back on their track without great cause.

If the trunk line has passed by your town, it may be that by a system of county highways a short-cut can be made across a bend of the state road, thus placing your town on the most direct route with just as good roads as the trunk route.

In any event you want good roads reaching to the through highway and the more of them you have, the better.

Advertise Your Good Roads

Don't stop with merely having the roads. Advertise them. Rent a bit of private land at the corner where your road joins the trunk line. On this little corner place such signs as seem desirable. They will be safe from the attacks of hoodlums from any rival town if on private property, since meddling with them will be a misdemeanor.

At this corner call attention to the fact that your route is the shortest route to certain points. Advertise the fact that your road is a good road. If you have a particularly good hotel, motorists will be glad to go out of their way to patronize it. If your town offers exceptionally good and economical garage service and stocks of supplies better than the average, if gasoline is cheaper than on the trunk line, if the scenery is better your way, say so. No one town can offer all advantages, but offer what you can.

If you have more advantages than can be enumerated on one board so the tourist can read it in passing, place other boards farther back on the route.

Use boards along the road to get the tourist's mind adjusted to the possibility of changing and coming your way. Begin an educational campaign about the advantages of taking in your town away back an hour's run from the fork of the roads. Put all this matter on plain signboards on private land.

Consult with the makers of route books and road maps and see that your town is properly routed and the roads given credit for their class. Your board of trade even may find it possible to advertise the attractiveness of the town in such publications.

Get Police to Co-operate

Spend a little money in motoring publications to call attention to the fact that your town is a good town to take in. See that fair rules are made governing speeding, use of cutouts, etc. See that all local officials feel right toward the motorist and that they are willing to treat him like a fellow-being. Arrest reckless drivers and malefactors of course, but don't lay any speed-traps.

When you have made sure that your town will treat touring motorists right, advertise the fact. Post a big board out on the road in each direction saying, "Greenville Friendly to Motorists. Speed Limit 20 Miles. Close Cutout Except on Hill Streets. We Want Your Patronage. We'll Treat You White."

When a touring party sees such a sign when rolling into a strange town, to a man their hearts warm toward that town, and if there is any opportunity, they will stop there.

The tourist is looking for the honest garage and the fair-minded hotel keeper. Even he with plenty of money objects to being robbed and goes out of his way to keep others from coming into the town that robbed him. One of the first steps to take in fitting your town to treat motorists right is to get the hotel and garage people into the right mental attitude.

Your town is in business, not merely for today or for this season. It is in business to stay. Like a store, it wants its patrons to come back and to recommend it to their friends.

Another help in interesting the traveler is by showing him that you are ready to help him through a local bureau of road and travel information. Perhaps you have no motor club that can afford to maintain information headquarters, but your board of trade can afford to pay some drug store or cigar store for maintaining an information bureau. As a matter of fact, it would be a profitable thing for such a store to provide that service as a means of getting the motorists' trade.

Free Touring Information

This bureau should be able to give the condition of the roads for 50 miles in any direction and to tell travelers of good hotels on any route, half a day's travel away. If the man in charge of the information will get into personal touch with hotel and garage keepers within a hundred miles and tell them he wants to be able to recommend them unreservedly if they are worthy of it, he will be enabled to find the right people to suggest. By asking callers to send back word of any failure to accord right treatment, he will put a check on his listed places, and by telling their proprietors that he is going to ask this, he will also incline them to honesty.

Of course prompt attention should be given by the local board of trade to any complaints of overcharging by the home people. It might even be well to put up a board at the entrance to town reading, "If you are overcharged anywhere in our town, report the matter to So-and-so."

By thus bringing into the bright light the business of every man who is engaged in serving the tourist, fair treatment will be compelled.

Natural scenery or important manufacturing enterprises located in your town ought to be advertised out on the road. You never know when the man is coming along who wants to see just the thing you have to show him. If your town excels in any particular, make the fact known.

Just because the makers of the trunk lines did not put you on the map is no reason why you should not get on. Raise as much money as you can for the purpose. Raise even more interest than money. Then go as far as circumstances allow to bring motorists out of their route to your door.

MARKER FOR PIKES PEAK ROUTE

A snow-white mountain peak on a maroon background with the wording, "Pike's Peak Ocean to Ocean Highway," is the design adopted for the official marker of this road association at a meeting of the board of directors held at St. Joseph, Mo., recently. The marker will be 12 by 16 inches and will be placed at both entrances to towns along the route and also at intervals of every 5 miles or less.

In addition, road directions will be indicated by a complete system of pole marking. Red and white bands, each 10 inches in width, will be placed on four poles at each turn and at such other places along the route as they may be needed. Danger signals, with red lettering on a white background, also were adopted.

The actual work of marking will be taken up by the respective state divisions and will be pushed to early completion. That portion of the road between Springfield, Ill., through St. Joseph and Colorado Springs to Salt Lake City, Utah, will be first marked, and as soon as arrangements can be perfected with eastern and western connections the road will be completely marked from ocean to ocean.

It is also planned by this association to establish headquarters for touring information at points along the route, where road data will be given without charge.

NEW ROUTE TO COLORADO SPRINGS

A new and more direct highway connecting Oklahoma City and Colorado Springs is now on the map as a result of a conference held at Oklahoma City on June 23, in connection with the organization meeting of the Oklahoma Good Roads Federation. This new Oklahoma-Colorado trail includes the Oklahoma-Kansas Northwest trail, that portion of the Santa Fe trail between Dodge City, Kan., and Pueblo, Colo., and the north-and-south highway between Pueblo and Colorado Springs. This route crosses the state of Oklahoma diagonally, passing through El Reno, Geary, Watonga, Eagle City, Canton, Sailing, Richmond, Mutual, Charon, Woodward and Buffalo, thence through Ashland, Kan., due north to Dodge City, Kan., where it joins with the New Santa Fe trail.

It is the intention of the various cities and counties interested in the road to have it officially marked and logged, and to see to the early completion of a few necessary links. At the present time, the trail, although much of it is natural prairie road, is in good condition and entirely passable. Agitation will be taken up looking to the rapid development of the route. Markers will be placed the entire distance from Oklahoma City to Colorado Springs.

The road will not be in conflict with existing Oklahoma-Colorado connections, but simply will afford another avenue for the travel which turns mountain-ward every summer from Oklahoma and its neighbors to the south and east. The Oklahoma, Texas and Gulf highway, running north and south, connects with the Santa Fe trail at Florence, Kan.; the Meridian road through Kingfisher and Cherokee has a connection to Fort Dodge, Kan., while a third, the Interstate Postal highway, connects at Amarillo with the Colorado to the Gulf highway.

Ultimately it is the expectation that the Oklahoma-Colorado trail will seek a southeastern connection with Oklahoma City and will extend to New Orleans or some other point on the Gulf of Mexico.

The log of the road follows:

	Miles
Oklahoma City to El Reno	30
To Geary	24
To Greenfield	9
To Watonga	10
To Eagle City	13
To Canon	10
To Solling	21
To Richmond	7
To Mutual	11
To Charon	12
To Woodward	14
To Buffalo	40
To Kansas-Oklahoma line	18
To Ashland, Kan.	12
To Mineola, Kan.	28
To Dodge City, Kan.	22
To Garden City	50.7
To Syracuse	52.9
To Lamar, Colo.	53.8
To Las Animas, Colo.	37.2
To La Junta	21
To Rocky Ford	10.6
To Manzanola	8.9
To Fowler	8.4
To Pueblo	36
To Colorado Springs	42.9
Total	549.4

Answers to Readers' Route Inquiries

To the Historic South

SUPERIOR, Wis.—Editor Motor Age—Kindly give me the best route from Ashtabula, or Painesville, O., to Harper's Ferry, W. Va., and thence to Staunton, Va. If two good routes are available I shall be glad to know of both, using one going and the other returning.—P. G. Stratton.

From Painesville follow the shore route for 42 miles through Unionville and Ashtabula to Conneaut, O., turning south for Pittsburgh, 131 miles, through Andover, Hartford, New Bethel, Newcastle, Moravia, Homewood, Beaver Falls, Freedom, Economy, Sewickley and Glenfield.

Over a macadam mountain road with easy grades the route from Pittsburgh to Bedford, 97 miles, is a particularly scenic one and will take you through E. McKeesport, Greensburg, Ligonier, Katner, Bedford. From Bedford route through McConnellsburg, Mercersburg, Greencastle, Hagerstown, Md., Sharpsburg, Shepherdstown, W. Va., and Halltown; Harper's Ferry is 4 miles east. This entire section is picturesque, historical and interesting, and the distances between the towns relatively short. Returning to Halltown, Staunton is then reached via Charleston, Berryville, west to Winchester, and then south through Middletown, Strasburg, Woodstock, New Market, Harrisonburg, Burkstown and Mount Sidney.

For the return portion you might route first to the famous Virginia Hot Springs, a distance of 63 miles from Staunton, passing through Churchville, Fairview and Warm Springs. Then from the Springs go to Cumberland, 153 miles, via Warm Springs, Monterey, Franklin, Frankford, W. Va. Or, should you not wish to include the Virginia Hot Springs in your itinerary you can go directly to Cumberland from Staunton, 156 miles, through Churchville, McDowell, Monterey, Franklin, Frankford.

Then from Cumberland go to Washington, Pa., over the National pike, 101 miles, routing through Frostburg, Grantsville, Keyser, Addison, Farmington, Uniontown, Brownsville, and Beallsville; thence 36 miles further through Wolftown, W. Middletown, Independence, Pa., Wellsburg, W. Va., Follansbee to Steubenville, O.

Now it is 119 miles to Cleveland via Canton and Akron, going through Richmond, Amsterdam, Carrolltown, Magnolia, Industry, Canton, Springville, Akron, Ghent, Independence, and 44 miles to Ashtabula through Willoughby, Painesville, and Geneva. Blue Book, volume 3, covers this entire section.

San Angelo, Tex.,-Phoenix, Ariz.

San Angelo, Tex.—Editor Motor Age—Kindly give me the best route from San Angelo, Tex. to Phoenix, Ariz. Is there a tourable road between Roswell, N. M., and Phoenix?—Henry Ragsdale.

Leaving San Angelo go first north through Sterling City, Garden City, Big Springs, Lamesa, Tahoka, Lubbock, Abernathy, Hale, Center, Plainview, Tulia, to Canyon, Tex. At this point you head westward and proceed for 92 miles over the Pan Handle Pacific highway to Clovis, N. M., through Umbarger, Hereford, Texico; continuing on this same highway, go 115 miles, through House to Santa Rosa, thence 150 miles via Pastora, Negra, Estancia, Moriarity to Albuquerque. A side trip to Santa Fe can be made.

If it is your intention to visit Roswell, N. M., then when at Lamesa instead of going north to Lubbock, go to Brownfield, thence over the Borderland trail for 146 miles, through Tokio, Plains, Bronco, Tatum, to Roswell. Before leaving Roswell, make inquiry of the Roswell Automobile Co. as to the road conditions and directions for the route through Vaughn to the point where you meet the Pan Handle highway, on which you turn west, going through Moriarity and Tijeras to Albuquerque.

A distance of 102 miles over a good road on which fast time can be made takes you to Magdalena, N. M., via Old Hubbell Ranch, Kirkpatrick Spring, Becker, Socorro, Blue Canyon; thence to Springerville, Ariz., 130 miles over a good, fast road through Datil, Quemado; 146 miles to Globe, passing through the Apache Indian reservation, the towns being White River, Fort Apache, Cutter; and the last stretch of 115 miles to Phoenix via Livingston, Roosevelt, Goldfield, Mesa, Frankenburg, and Tempe.

For the return journey we shall give you the southern routing over the Borderland trail, and in this connection would draw your attention to the article on this trail by C. H. Lester in the June 25 issue. It is 135 miles to Tucson through Mesa, Higley, Florence, Olsen's Ranch; 141 miles through Vail, Turner, Fairbanks, Tombstone, Bisbee, and Lowell to Douglas, Ariz.; 162 miles to Deming, N. Mex., via Bernardino, Granite Pass, Lordsburg, Separ, Mongolia; 60 miles to El Paso through Myndus, Afton, Lanark, Canutillo. El Paso-Roswell section, 225 miles via Ruidoso, San Patricio, Hondo. From Roswell follow the itinerary given above, going to Brownfield thence to San Angelo. The Borderland trail is a good natural dirt road and improvements are being made on it constantly.

Rogers, Ark.-St. Louis, Mo.

Rogers, Ark.—Editor Motor Age—Kindly give me the best route from Rogers, Ark., to St. Louis.—J. M. Henderson.

From Rogers we would suggest that you route through Exeter, Fairview, Granby, and Diamond to Carthage, thence via Lamar, Sheldon to Nevada; and north through Arthur, Rich Hill, Butler, Adrian, Garden City, Harrisonville, Belton, Grandview to Kansas City.

From Kansas City proceed eastward over the Santa Fe trail through Independence, Levasy, Wellington, Malta Bend, Marshall, Boonville; here you cross the Missouri river and then follow the Boon's Lick road through New Franklin, Rocheport, Columbia, Fulton, Mineola, Jonesburg, Wright City, Wentzville, Colterville, St. Charles, St. Louis. It is a good day's run from Kansas City to Columbia, Mo., 153 miles, and 141 miles more to St. Louis.

At Nevada it is possible to go to Boonville via Schell City, Appleton City, Clinton, and Sedalia; then continue on the Boon's Lick road to St. Louis as outlined above. However, before deciding upon this option it would be well to make local inquiry as to road conditions, etc.

Good Route to Adirondacks

Syracuse, N. Y.— Editor Motor Age—The following is the best route for tourists to take from Syracuse to Old Forge, in the Adirondacks. Follow State route east to Utica. all State road, making detour Kirkland to New Hartford. From Utica on State road through Deerfield, South Trenton, to Trenton. Dirt road, Trenton to Remsen. State road from Remsen through Alder Creek to Boonville. From Boonville follow sand road to Black River, Black River to McKeever on same kind of road, McKeever to Old Forge on State road. This route is recommended by tourists who have just covered it.—O. L. Lyman.

Little Rock-Jacksonville, Fla.

Arkadelphia, Ark.—Editor Motor Age—Kindly give me the best route from Little Rock to Jacksonville or Tampa, Fla.—R. B. F. Key.

Routing first 114 miles to Forrest City, Ark., you should pass through Galloway, Lonoke, Prairie Center, Hazen, Clarendon. Wheatley, Spur; thence 49 miles through Madison, Marion, Mound City to Memphis. It is 160 miles to Tuscumbia, Ala., routing via Germantown, Moscow, Grand Junction, Saulsbury, Essary Springs, Tenn., Corinth, Miss., Burnsville, Iuka, and Cherokee, Ala., and 43 miles through Leighton, Courtland, Hillsboro, to Decatur, Ala.

You will have to motor 95 miles to reach Birmingham, Ala., the intermediate points being Hartsells, Cullman, Bangor, Kimbery and Morris. The Birmingham-Atlanta stretch of 190 miles is through Trussville, St. Clair Springs, Ashville, Peeks Hill, Anniston, Iron City, Edwardsville, Tallapoosa, Ga., Bremen, Temple, Douglasville, Mableton, Atlanta.

It is possible on reaching Decatur to go to Atlanta via Chattanooga, and such an option would be: Decatur, thence 117 miles through Huntsville, Woodsville, W. Scottsboro, and Jasper to Chattanooga; and 136 miles through Rossville, Lafayette, Rome, Cartersville, Marietta and Buckhead to Atlanta.

Atlanta to Macon, 98 miles, is via Jonesboro, Pomona, Milner, Forsyth, Lorane; to Valdosta, Fla., 150 miles through Henderson, Vienna, Sibley, Chula, Eldorado, Adel; and the last section to Jacksonville, 142 miles, through Lee, Falmouth, Live Oak, Lake City, Olustee, McClenny.

You will find the Blue Books very useful for this trip. You will need a volume 5 for the district west of the Mississippi, and volume 3 for the balance of your routing. These are published by the Blue Book Pub. Co., Chicago, and retail at $2.50 each.

Lincoln Trail Information

Indianapolis, Ind.—Editor Motor Age—Probably at no other time of the year is the Lincoln trail, or the Vincennes-St. Louis route, so good for touring as now. Every foot of the way has been put in condition, and the telephone poles along the way bear the red, white and blue markers of the association designating the correct route. Tourists who are contemplating trips along this historic route should not hesitate for fear of road conditions, as they are ideal.

From Vincennes to Olney the original trail as marked should be followed. Some new roads near Lawrenceville may hinder going, but on the whole, the roads are in fine shape. Just west of Olney several miles of new rock road make hard travelling, and the tourist should inquire about the best route. A south road, slightly longer, but much smoother, is being used at the present by nearly all tourists.

Through the Clay City bottoms the roads are better than they have been for years. Liberal use of the grader and drag have improved conditions wonderfully, and except after a very hard rain, going is good. The original trail should be followed clear into St. Louis from Noble. Almost every city along the route has ample garage facilities, but Salem, Flora, Olney, and Lawrenceville are the favored stopping places of the usual tourist.—Tourist.

Bedford, Ind.—Editor Motor Age—Kindly furnish me with the routing from Bedford, Ind., to Dallas, Tex. I am not particular about going through certain cities, but want to find out the best roads to our destination. —John J. Quinn.

Go first to Mitchell thence via Shoals, Loogootee, Cannelsburg, Washington, and Wheatland to Vincennes. Over a natural dirt road, good in dry weather, route to St. Louis through Lawrenceville, Olney, Clay City, Flora, Salem, Carlyle, Breeze, Shiloh, St. Louis. A longer routing, with better road conditions west of Terre Haute would be to go to Bloomington through Needmore, and Clear Creek, thence to Terre Haute over the poor stone pike road through Elletsville, Spencer, Vandalia, Bowling Green, Terre Haute. The Terre Haute-St. Louis section, 173 miles, is over natural dirt roads good during the summer, through Marshall, Casey, Jewett, Effingham, Altamont, Vandalia, Hagerstown, Mulbery, Pocahontas, St. Jacobs, Collinsville.

It is a 2-days' run to Kansas City, the first day of 141 miles to Columbia, Mo., being through St. Charles, Wentzville, Warrenton, Danville, Calwood, Millersburg; the second day to Kansas City, 153 miles, via Rocheport, New Franklin, Boonville, Marshall, Waverly, Wellington, Buckney, Kansas City.

With 234 miles to Arkansas City over good dragged road you should route via Martin City, Olathe, Edgerton, Ottawa, Williamsburg, Waverly, Emporia, Cottonwood Falls, Clements, Florence, Burns, Eldorado, Haverhill, Augusta, Douglas, Winfield.

Going south to Oklahoma City, 137 miles, over a section of the Oklahoma, Texas and Gulf highway, you will pass through Newkirk, Ponca City, Bliss, Perry, Mulhall, Guthrie, Edmond, Oklahoma City. Keeping on this same highway go 196 miles to Denison, Tex., through Noble, Lexington, Wynnewood, Sulphur, Milburn, Durant, and Colbert; thence 85 miles via Howe, Anna, McKinney, to Dallas.

Complete directions for this trip are given in volumes 4 and 5 of the Blue Books.

Wilmington-Atlantic City Route

Wilmington, Del.—Editor Motor Age—A bad stretch of road in lower New Jersey having operated against motor traffic from Wilmington and the south to Atlantic City via ferry from Wilmington, a new way has been found which eliminates the road that caused the trouble, makes a good road all the way and makes practically no difference in the time, the run between Atlantic City and the Wilmington Ferry terminus being about 2 hours.

The route is as follows: After leaving Penn's Grove, N. J., which is the Jersey terminus of Wilmington ferry, drive straight out from the pier to what is known as the four corners and then turn to the left; continue to point 2 and then turn to the right at the cross roads before entering Auburn, N. J.; at Woodstown turn to the right and immediately turn left and on to Pitts Grove and from there on to the old route, which is marked.—A. O. H. Grirr.

Durant, Ia.-Swift Current, Sask.

Durant, Ia.—Editor Motor Age—Please give me the best route to Swift Current, Sask., Can., by way of Winnipeg.—A. Schiele.

Route first through Moscow to Iowa City, then north through North Liberty and Shueyville to Cedar Rapids; turning west here and heading for Marshalltown, Ia., through Belle Plaine, Chelsea, Tama, Butlerville and Le Grand; this is a good day's run of 141 miles.

From Marshalltown go to Ogden, 65 miles via State Center, Colo., Ames, Boone; thence to Fort Dodge, Ia.; 41 miles by way of Dayton, Otho and Roberts. Now turn north, passing through Humboldt to Algona, 42 miles; then west through Whittemore, Emmetsburg and Dickens to Spencer, Ia., 51 miles.

It is 109 miles to Sioux Falls, S. D., over a section of the North Iowa pike, running through Hartley, Sanborn, Sheldon, Hull, Canton, and Harrisburg. Over a good dirt road the trip to Brookings, S. D., covers 58 miles via Dell Rapids.

A distance of 133 miles to White Rock, S. D., takes you through Clear Lake, Altamont, Milbank, Clinton, Graceville, and Wheaton, and 79 miles more through Dwight, Abercrombie, Hickson to Fargo, N. D.

The Fargo-Grand Forks section, 96 miles, is through Mapleton, Hillsboro, Taft, Reynolds, Merrifield; thence 159 miles to Winnipeg, Can., via Manville, Ardoch, Minto, Grafton, St. Thomas, Hamilton, Pembina, Letellier, Morris, St. Agathe, St. Norbert to Winnipeg.

Before leaving Winnipeg it would be well to secure some local information as to the roads the balance of the distance, the towns en route being Portage la Prairie, Brandon, Regina, Moose Jaw to Swift Current.

We recommend that you secure volume 5 of the Blue Book, published by the Blue Book Publishing Co., Chicago. This gives complete running directions from your home town to Winnipeg, together with many optional routes between these points.

New Brighton, Pa.-Canton, Ill.

New Brighton, Pa.—Editor Motor Age—I would like the best route to Canton, Ill., with distance.—T. L. Kennedy.

Route to Line Lexington and Montgomery, then 71 miles to Lancaster via Springhouse, Ambler, Broad Axe, Norristown, Glenloch, Whitford, Downingtown, Coatesville, Sadsburyville, Williamstown and Paradise. With 162 miles to Bedford a good road predominates through Columbia, Wrightsville, York, Thomasville, Abbottstown, New Oxford, Gettysburg, McKnightstown, Cashtown, Fayetteville, Chambersburg, St. Thomas, Ft. Loudon, McConnellsburg, Breezewood and Everett, then 97 miles to Pittsburgh, with fine views from the mountains routing via Wolfsburg, Buckstown, Ketner, Stoyestown, Jennerstown, Laurel Ridge, Ligonier, Greensburg, Adamsburg, Jacksonville, Wilkinsburg and Pittsburgh. It is a distance of 190 miles to Columbus, O., over as favorable a road as can be found via Bridgeville, Canonsburg, Washington, Claysville, Elm Grove, Wheeling, Bridgeport, St. Clairsville, Morristown, Hendrysburg, Fairview, Cambridge, New Concord, Norwich, Zanesville, Mt. Sterling, Gratiot, Hebron, Kirkville, Reynodsburg.

Columbus to Indianapolis is 176 miles, partly over the National road, starting through Lafayette, Summerford, Brighton, Vienna, Harmony, Springfield, Fairfield, Harshman, Dayton, New Lebanon, Eaton, Westville, Richmond, Centerville, Germantown, Cambridge City, Dublin, Lewisville, Cleveland, Greenfield and Cumberland.

A practically all-gravel road runs to Champaign, 128 miles, through Brownsburg, Lizton, Jamestown, New Ross, Crawfordsville, Waynetown, Veedersburg, Covington, Danville, Homer and Urbana, then mostly natural dirt to Peoria, 94 miles, through Mahomet, Harris, Farmer City, Le Roy, Bloomington, Danvers, Mackinaw, Tremont and Groveland.

Canton is 33 miles further, over natural dirt roads, through Pleasant Valley, Hanna, Trivoli, Farmington and Norris.

Austin Sues Cadillac On Two-Speed Axle Patent

Latest News of the Motor Industry

DETROIT, MICH., July 8—The adoption of the two-speed rear axle by the Cadillac Motor Car Co., Detroit, has resulted in a patent suit against it by W. S. Austin, head of the Austin Automobile Co. He charges in a suit in the United States district court in Grand Rapids, Mich., that a two-speed axle patent which he holds has been infringed and asked damages and an injunction restraining the Cadillac company from further use of the device. He charges that 15,000 Cadillacs which infringe have been marketed.

The Cadillac company, in explaining its position, states that it was approached early in the spring of 1913 by Austin with a proposition that it use his two-speed axle on the Cadillac. It was found, it is claimed, that the Austin invention, which provides one clutch on the rear axle and one on the drive shaft was not satisfactory. A device incorporating one clutch, and that located on the drive shaft, had been patented in 1902 by Willis G. Caffrey and this patent was purchased by the Cadillac company. It is stated that Austin was granted a patent on specific details in March, 1914.

Since the date of the Caffrey patent, and prior to the date of the Austin patent, it is stated, many French, British and American patents have been taken out on details and modifications of the Caffrey device.

"Our patent attorneys," said Henry M. Leland, of the Cadillac company, "inform us that we do not infringe the Austin patents in any respect. We considered the two-speed axle proposition 5 years ago and from then until the time we adopted it we experimented with various designs."

WEED STOPS PERRY COMPANY

Cincinnati, O., July 6—The Perry Chain Co., Lansing, Mich., which began manufacturing tire chains in 1909 and which since that date has been prosecuted in the courts by the Weed Chain Tire Grip Co., was ordered to cease operations last week by the United States circuit court of appeals in Cincinnati. This court sustained the decision of the United States district court for the eastern district of Michigan, which held the Parsons' patent, No. 723,299, infringed in an action which was terminated last fall.

DODGES INCORPORATE

Detroit, Mich., July 8—Special telegram—Dodge Bros. have incorporated, the capital stock being $5,000,000. John F. Dodge is president and treasurer, Horace E. Dodge, vice-president and general manager, Alfred L. McMeans, secretary and office-manager. The two brothers hold equal amount of stock giving them full control, while McMeans holds the balance.

"No announcement about our new car will be made for at least 2 months," said G. C. Hubbs, of Dodge Bros., "and when this announcement is made the Dodge cars will be in the hands of dealers. In other words we will keep everything concerning the Dodge car secret until the sample cars for our dealers are in their possession."

KNOX STOCKHOLDERS SUE

Springfield, Mass., July 7—About 100 holders of preferred stock of the Knox Automobile Co., most of whom, as creditors, accepted stock in lieu of cash for the payment of claims at the time of the reorganization of the company in October, 1912, filed suit on June 30 in the superior court against the estate of A. N. Mayo.

The bill of complaint was filed by a committee and in it damages are claimed because, the complainants allege, the late Mr. Mayo, who was treasurer and the controlling force in the company, used funds to expand the business that should have gone to the creditors under the agreement.

STERNBERG CHANGES TITLE

Milwaukee, Wis., July 6—On July 1 the Sternberg Mfg. Co., which manufactures Sternberg trucks became the Sternberg Motor Truck Co. The present corporate name was given more than 40 years ago, when William Sternberg, Sr., president, commenced the manufacture of traction engines in Davenport, Ia., and this name has been continued since the Sternberg company started the building of motor trucks at its West Allis, Milwaukee, shops, 9 years since.

The Sternberg Motor Truck Co. is building for the 1915 market four sizes of worm-driven trucks—½ ton, 2, 3 and 5 ton, and it is announced that deliveries of 1915 3 ton worm demonstrators will commence the latter part of August, and that beginning in September, deliveries of the 2-ton worm demonstrators will commence; the ½-ton and 5-ton worm units being ready for the market about the middle of the fall.

SEPARATE POPE SALE FAVORED

Hartford, Conn., July 7—Special telegram—Being of the opinion there is a chance for the preferred stockholders of the Pope Mfg. Co. if the bicycle plant at Westfield, Mass., and the motor car plant at Hartford are sold separately. Judge William L. Bennett, of the superior court, today dismissed the petition of the Boston creditors' committee that the entire assets of the company be sold at auction in Massachusetts by Receiver George Pope. The Pope company receivership is in the federal court in Massachusetts and an auction sale of the entire assets would necessarily have to be in Massachusetts.

Parties interested were heard by Judge Bennett last Thursday, when it appeared that a syndicate of Boston bankers would bid $1,800,000 for the entire property if title could be given by September 1.

FIRE IN HAVERS PLANT

Detroit, Mich., July 8—Special telegram—The main plant of the Havers Motor Car Co., Port-Huron, was destroyed by fire last night. Several finished cars, chassis, bodies, and parts were consumed, the damage being estimated at $60,000. The origin of fire is unknown.

NEW HERRESHOFF RULING

Detroit, Mich., July 7—After having consulted Referee in Bankruptcy Lee E. Joslyn, the Detroit Trust Co., Detroit, trustee for the Herreshoff Motor Co., Detroit, has made a demand upon numerous creditors of the bankrupt company, that they return the money they collected, because, according to the bankruptcy law of the state of Michigan all creditors are to be treated in the same way, without preference, within 4 months of the time the bankruptcy petition has been filed and it appears that these creditors of the Herreshoff company have received preferential treatment and this is what the trust company is trying to clear.

SEPARATOR ORDINANCE REPEALED

New York, July 8—Special telegram—At the aldermen's meeting yesterday the 4-year old statute requiring the installation of gasoline and oil separators in garages was repealed. This is a signal victory for the garagemen who have fought the ordinance for 4 years.

BROWN-LIPE ADDS TO LINE

Syracuse, N. Y., July 6—The Brown-Lipe-Chapin Co. of Syracuse has just entered into an agreement with the M. and S. Gear Co., of Kansas City, Mo., whereby the Syracuse concern has secured the American manufacturing rights of the M. and S. differential exclusively for the general trade.

The M. and S. differential performs the same function as the ordinary or conventional type of differential now generally in use. It is claimed that it has the additional feature of applying the most power to the wheel having the greatest traction more than is the case with the ordinary differential so that whenever one of the driving wheels gets into a mudhole or a place in the road where it cannot get traction the other drive wheel will pull it out. The dangers of skidding on slippery pavements are also reduced to a minimum, it is asserted.

Ideal Car Is Discussed by Engineers at Cape May

Three of the Papers Presented to Summer Meeting of S. A. E.

THERE are a number of difficulties peculiar to the six-cylinder construction. The vexed question of six-cylinder carburetion has never been settled. The difficulty of eliminating periodic vibrations with the necessarily long crankshaft still remains pronounced. Also, probably owing to piston friction principally, the six-cylinder engine is invariably less efficient than a four-cylinder of equally good construction—efficient, that is to say, in the power to volume ratio. This means that for a given power a six-cylinder car must necessarily be considerably heavier than a four-cylinder. Add to this increased cost for a given power, decrease of available body space for a given wheelbase, or greater length and therefore cumbersomeness necessary to carry a bigger body, and most of the disadvantages of the six-cylinder car have been summed up. On the other hand, there are a few six-cylinder cars which possess greater smoothness than has yet been attained with any four-cylinder, owing to the undeniably better torque, but none of these cars is efficient. They are cars which, while suited excellent to bear elaborate carriage work and provide luxurious travel at moderately high rates of speed, are seldom found in the possession of men who drive themselves or take a great interest in the mechanism. From an advertising point of view the six-cylinder car appears to have been made the only possible thing for America. In Europe the six-cylinder argument is practically dead.

It is, however, possible that the present position of the six-cylinder car in Europe is misleading because no effort has been given to the production of a really efficient six-cylinder, except by the Sunbeam company; the 30-horsepower Sunbeam holds records which leave no doubt whatever concerning its efficiency. The method followed by such concerns as the Sunbeam company is, first, to produce highly efficient cars and then obtain quietness, etc., without depreciating the efficiency. In this the Sunbeam and Vauxhall companies in particular have been remarkably successful.

In making a new car for England or the continent it would undoubtedly be far better to specialize on a highly efficient four-cylinder type and leave the six-cylinder entirely alone. On the other hand, it seems that for a new American car the so far untried scheme is the production of a highly efficient six-cylinder. The specification hereunder is a suggestion for the main characteristics of such a chassis.

Specification for Motor

The dimensions should be certainly not more than 4 inch bore by 6 inch stroke and there would be several advantages in adopting 3½ inch bore and 5½ inch stroke; this latter size would be capable of giving as much power as the largest American six-cylinder engines if the engine were made in accordance with European principles. The advantages of the smaller dimensions would be less weight, lower cost, greater ease in eliminating vibration and less overall length.

The cylinders should be cast in threes with the valves all on the right-hand side. The three-cylinder blocks are quite handleable by one man; can be rigged in position quickly and easily; are not so likely to be bad castings owing to having less complication than a block of six; need not actually require more machining if care be taken in the design; and, finally, are much easier to remove and replace. When four-cylinder blocks were first introduced there was much complaint in certain quarters that private owners would find them very awkward to take off, and undoubtedly there was something in the objection. A six-cylinder block needs very elaborate tackle and several men to remove it from and replace it on the crankcase for cleaning with the pistons in position.

The water-jacketing should be sufficiently generous to enable thermo-syphon cooling to be satisfactory with an atmospheric temperature of 80° F. in ordinary country. In the cylinder blocks the passages to the intake should be cored and carried through the water-jacket to the opposite side to the valves, bringing the carbureter on the left-hand side. Between the carbureter and the cylinder castings the shortest possible pipe should be used and this also should be jacketed in a manner ensuring ample circulation of hot water.

The crankshaft should have seven bearings because, although it is possible to make a fairly satisfactory engine with a smaller number, the best possible running cannot be obtained unless the supports for the shaft possess the maximum of rigidity and this can be the case only with seven bearings. The diameter should be not less than 2½ inches, this applying to both the main journals and the crankpins, while the webs should be proportionatly stiff. Weight should not be spared in the crankcase, as the success, or non-success, of the six-cylinder engine depends almost entirely on the absolute rigidity of this portion. Very stiff webbing to support all the bearings is therefore recommended, and the case itself should be distinctly on the thick side. Distribution gearing should be by inverted-tooth chain. A chain 3 inches wide is recommended; 2½ inches might be regarded as the minimum.

Valves should be not less than 2⅛ inches diameter. For lubricating arrangements the crankshaft should be drilled and oil supplied to each main bearing at about 30 pounds per square inch pressure. The oil would pass through the shaft to the big ends and no special means need be taken for lubricating the piston-pins or the cylinders. To prevent the access of too much oil to the cylinders the crankcase should be made with a false top. Immediately beneath each cylinder the only connection with the crankcase should consist of the narrowest slot through which it is possible to insert the connecting-rod, but the baffle-plates should not close the bottom of each cylinder individually. A method which has been employed very successfully is to extend the crankcase upwards above the baffles, which are cast in one piece with it, so that the cylinders stand open to a shallow chamber—say one inch deep—running the whole length of the crankcase and separated from the crankshaft by the thin web with the necessary six connecting-rod slats. This longitudinal chamber allows the air displaced by the descending pistons to travel through the oil-laden atmosphere of the crankcase proper. It has been found that ample lubrication is obtained when using high-pressure oil-feed, and with this scheme smoking troubles are overcome.

The suggested design includes a recommendation that the flywheel be placed at the front end of the motor instead of at the rear, as usual.

Clutch and Gear-Box

A lengthy experience of clutches of every kind has led to the conclusion that the dry-plate clutch, in which one surface is steel and the other woven wire and asbestos compound, is the most satisfactory for cars of high power.

Turning now to the gear-box, four speeds with a reverse should, of course, be provided. Wheels with big teeth are preferred. Considerable width of tooth is also an advantage from the point of view of silence. The spigot should run on ball bearings, but the main shaft and layshaft may be mounted on either ball or taper roller bearings. The advantage of using the latter is that it eliminates the otherwise absolutely essential thrust race on the mainshaft, but the control should undoubtedly be in the center of the chassis, the gate thus coming immediately on top of the gear-box.

An arrangement of steering-gear which allows for a slight adjustment for rake is also recommended, not to enable different angles to be obtained for different styles of body-work, but to allow the driver a little latitude as to the closeness of the wheel. This is a point which has been neglected very much indeed, but there is no doubt that a large man is far better suited by a wheel rather higher up and rather further forward than a small man. All that is needed is an arc of travel giving about 3 inches of movement measured at the top end of the steering-column.

Fuel Feed

The method of fuel feeding probably most satisfactory is to force fuel by air pressure from a large tank through a small tank on the dashboard to the carbureter. This small tank will trap sufficient fluid to enable a start to be obtained and to give a few minutes' running without the necessity of pumping up the pressure-system by hand. One cannot obtain efficiency with a long inlet-pipe and it is impossiole to avoid the use of a long inlet-pipe with a gravity-feed because the tank cannot be mounted at a sufficient altitude, even on the dash, if it is to hold enough gasoline for 200 miles. It would, however, be possible to devise a dashboard tank with two compartments and to use pressure merely to lift fuel from the bottom compartment to the upper one.

Brake Work

The contracting-band type of brake ought not to be considered. It has only one advantage, which is that it is easy to make very cheaply. A band-brake is never powerful, never quick in action, never easy to adjust, invariably gives rise to rattle, as it contains of necessity a large number of joints which get lubricated principally with

EDITOR'S NOTE—In the following pages are presented digests of four papers read before the Society of Automobile Engineers at their summer meeting at Cape May, N. J. Three of these are a part of the symposium on the ideal car. There were five papers in all on this subject, but the three given here are representative. No two of these discuss the subject from the same angle.

An entirely new idea is embodied in the digest of the fourth paper, by C. O. Edgerton and S. I. Fekete, dealing with a basis of motor vehicle taxation proportion to the road destruction caused. As a result of this, the society has entered upon an investigation of the possibilities of preparing an equitable taxation formula.

Highest Quality Six-Cylinder Chassis for America

BY A. LUDLOW CLAYDEN, M.I.H.E.

Editor Automobile Engineer, London.

mud, and moreover is extremely unsightly. Granting that extremely good working surfaces for brakes are steel and woven material such as has been recommended for the clutch, the best arrangement from all points of view seems to consist of wide cast steel drums, ribbed for cooling, fitted to each rear wheel, and two sets of shoes side by side each faced with lining material, one pair operated by the hand-lever and the other pair by the right-hand pedal. Such brakes can be enclosed completely so as to be protected from dirt. There are not many bearings or joints and all are easy to supply with adequate lubricators.

Scientifically Correct Distribution of Material

BY ALANSON P. BRUSH

Consulting Engineer A. P. Brush Engineering Company

THE ideal car is a ghost that we ought to lay; it has haunted most of us long enough. Ideal for what purpose? The carrying of one, two, three, four, five, six, seven, or more passengers? Ideal from whose standpoint? The foundryman, the drop forge man, the painter, the factory superintendent, the user, or any other of the hundred and one personalities interested in each and every car produced?

There is not, and never can be, an ideal car, but what there can and should be, is more progress toward the ideal in the motor car industry. I think that if we are to discuss ideals at all, we must recognize the word "ideal" as an expression of infinity and therefore capable only of indicating direction of progress with no possibility of final attainment. To get down into less rarified atmosphere and a little of the dust of commercialism in our lungs, where we can talk in finite terms of accomplishment, progress toward the ideal in the motor car industry, as I think you will agree, must be progress in the making of the car increasingly useful to the human race. If this be true then the greatest advance toward the ideal in any car, for whatever class of buyer, and of whatever size, is that car which will give to its ultimate user the greatest amount of satisfaction per dollar of total cost.

Distribution of Material

The most valuable are those which can give to the user superior results, at a reduction in cost. And chief among all progressive changes is, in my judgment, a more scientifically correct distribution of the material used in a motor car. Present-day conventional design seems to me to be a really praiseworthy development in appearance and comfort to the user but a development unaccompanied by sufficient study of the way in which materials are used to secure such comfort and appearance. For example, bodies, fenders, running-boards, running-board aprons, running-board supports, are no inconsiderable part of the weight of the modern motor car and yet their function in the conventional structure is solely that of securing desired appearance and comfort to the user. They do not, in any way, add to the stability of the car structure; on the contrary, they lessen it. The first national question with regard to these parts is—how can their weight be reduced, and, second, if we reduce their weight, will we not reduce their stability and produce a car that will in a comparatively short time become noisy, unsightly and unsatisfactory to its user? The third, and most promising viewpoint is—cannot some or all of these parts be made to perform their present functions of securing comfort and appearance and at the same time add to the stability of the car, by being so arranged as to carry the strains to which the whole structure is subjected in use?

I would place second in importance the consideration of the structure of the rear axle, because, while the amount of weight which can be saved here may not be very great, it is particularly valuable because it is necessarily unsprung, and therefore any weight reduction which does not introduce weakness or other objectionable characteristics, adds to tire mileage and to the riding qualities of the car.

I suggest for your consideration a moment's thought as to how much of the weight of the conventional rear axle can be taken out of it and still leave the same load-carrying capacity, or in other words, how much of the weight of a conventional rear axle is devoted solely to the propelling function and whether a considerable portion of this material could not be made to assist in the load-carry capacity of the axle, without detriment to its other duties, with a reduction in the total weight and cost of the structure and an actual increase in its serviceability.

I do not admit that motor discussion can be summed up from beginning to end in small-bore, long-stroke, and high-speed. As I see it basically, the opportunity for progress in motor design may be summed up as cost reduction per car-mile, without sacrifice of performance; and while an increase of motor speed may be one way of securing progress in this direction, it is not necessarily the only way or even the best way. Given the same weight per horsepower, other things being equal, a slower moving mechanism is bound to be more durable, and I believe that a more scientific distribution of the materials which go into the motor can result in a highly satisfactory weight and cost reduction.

Tendency in European Car Construction

BY ROBERT A. BREWER,

Consulting Engineer, London, England

THE following brief notes will convey an idea of the modern European tendency with regard to the demand of the public and will give what is possibly an advanced forecast of the most saleable type:

Cleanness of design is only obtained satisfactorily by the elimination of flat surfaces presented either to the direction of motion or at the rear of the body. Streamline contour is carried out in a more complete manner than it is understood in the states, for greater attention is paid to the rear part of the body as well as to the shape of the fenders. Seating capacity for four persons is a body width of about 44 inches, the backs of the seats reasonably high, i. e., the seat cushions resting on the floorboards. The cowl is so shaped as to merge with the windscreen set at an angle of about 45 degrees. This deflects the air current above the heads of the occupants without impressing too great a wind resistance. The total head resistance, plus rolling resistance of such a body on a good smooth road at about 60 miles per hour, would be about 25 horsepower, and the motor should therefore develop about 36 horsepower on brake test at say 2,000 r.p.m.

Four-cylinder, high-efficiency motors are far more popular than any other type. The six-cylinder has only a comparatively small field of adherents, and these of the wealthier class. Anything between 80 millimeter and 90 millimeter bore, or even 95 millimeter, will cover the requirements. The ultra long stroke is disappearing. A good size would be 85 by 140, 3¼ by 5½ inches, and should easily develop the necessary power.

Four forward speeds are necessary, direct on top. The gear ratio in the rear axle 3½ or 4 to 1. This enables a very large range on top speed drive. Right-hand driving is universal with the gear levers in an enclosed gate. Throttle control by foot pedal with over-riding hand-operated mechanism by small lever on the steering-column.

Springs are semi-elliptic all round, with a tendency to the cantilever. A modern motor being so reliable, accessibility is scarcely required, except to the carbureter and magneto. The former is preferably fed from a fuel tank contained in the cowl, gravity supply to the carbureter itself which is placed as high up as possible.

Such a motor should have no vibration, and when properly designed and made, runs equally smoothly at all speeds up to 2,500 r.p.m. Pressure-fed lubrication to all the crankshaft bearings is essential.

Discussion of Papers on the Ideal Car

THE discussion took several tacks, and much criticism of Mr. Clayden's paper on a six for America, due to its advocacy of several radical constructional features, was made. It seems highly probable that Mr. Clayden was not entirely familiar with average American road conditions when making several comments.

J. R. Cautley objected to Mr. Clayden's suggested chain width of 3 inches with a minimum of 2½ for timing gears, and other drive features in connection with the engine. He said that a 2-inch chain will prove amply wide. He questioned the great advantages of having the worm of the worm drive underneath the wheel, as suggested by Clayden, inasmuch as the overhead worm gives a greater clearance and has proven itself entirely satisfactory after long testing. No one has mentioned, Mr. Cautley pointed out, that there be an adjustable driving seat in this ideal car so as to accommodate the tall and the short driver.

David Fergusson thought the title of "ideal car" improper, as there is no finality in engineering. Things have to be changed and ideas altered as time goes on. He advocated the low gear ratio in combination with a flexible six cylinder motor as being the ideal combination.

A. P. Brush pointed out that while fundamental simplicity, as required by Mr. Davis, is to be sought, the ideal in car construction must be that progress in the making of a vehicle which is to be useful to the greatest number, that is, making it available to the majority.

Mr. Davis was of the opinion that an ideal of price would tend to eliminate a large number of the American cars, and it therefore resolves itself into a question of what standpoint is taken. While the tendency at this time is towards the low-priced car, he believed the pendulum will swing back again and that high-priced cars will predominate in a few years again.

F. E. Moskovics said that the subject should be attacked from two angles, either a technical one of how much can be accomplished for a dollar, or from the standpoint of luxury as to how perfect a car can be made without price consideration.

L. B. Brown thought that no better way of arriving at the acme of car design

could be had than by considering the faults of the present day car. There is nothing more vulnerable than the carbureter, he said, poor mixtures being a much greater fault to attack than some of the minute details considered by some of the papers.

John Wilkinson emphasized one point of ideal construction which seemed to him most important, and that is the scientific distribution of metals to give uniform strength throughout the vehicle. He likened such a construction to the "old one-horse shay" which kept going until such time as it completely gave out, every part going at the same time. His plea was to make motor cars that way so that they will have no vulnerable spot.

Howard Coffin tritely remarked that when a manufacturer can so design his cars that the output is all sold when it should be, and when at the same time the repair department grumbles because of lack of work, that maker is getting close to the ideal. At least, he is giving the people what they want. Mr. Coffin stated that all speakers had avoided the point of six-cylinders versus four-cylinders. To his way of thinking, the ideal construction depends largely upon which type of motor is used, as it makes a difference both back of the power plant and in front of it—both ways.

Mr. Coffin disagreed with the Clayden paper's stating that the six is heavier than the four with the same horsepower, and also more costly. The first idea of a six was a big engine, and America has been weaned from this idea sooner than Europe has. In his experience, Mr. Coffin has found an inappreciable difference in fuel consumption of sixes and fours of the same piston displacement. He criticized Mr. Clayden's statement that the six-cylinder motor for America should have seven bearings. Three allow the cylinders to be brought closer together, and the crankshaft to be shortened, which allows less twisting—a big consideration in a six.

From his experience also Mr. Coffin has found that the block casting of the cylinders is best from a manufacturing standpoint. He thinks the four-speed gearbox a joke for this country. The American driver hates to change gears, so why give him more of it to do, when the three-speed set requires less shifting and with a six-cylinder motor gives all the flexibility that could be demanded. Periodic vibration has been eliminated by increasing crankshaft size, Mr. Coffin citing an instance where the raising of the size from 1⅞ to 2 inches killed this periodic vibration.

He gave some comparative four and six production costs on a basis of some 10,000 output which showed that the six is really a cheaper proposition. A 4⅛ by 5½ four-cylinder engine having a piston displacement of 280 cubic inches proved in one instance to cost more to make than a 3½ by 5 six-cylinder type with a larger piston displacement—288 cubic inches. The six cylinders being in a block could all be bored at once, and being smaller in diameter than those of the four, these two factors overbalanced the four.

A. L. McMurtry recalled the first ideal car. It was the Pan-American car made by A. C. Bostwick and sought to incorporate all the best European ideas. Twelve were built, and they were a failure, because of quick heating, and so on. One great trouble, he said, is that salesmen lead to overloading a car, because they lead the buyer to believe that he can take as many as he likes, and puts no limit on the capacity.

When asked as to his opinions of right and left drive, Mr. McMurtry said that he has four test cars, three with left and one with right drive. He prefers the right drive for country work, as the left drive keeps the driver much longer in the focus of glaring headlights, often with much danger. With a right drive, the operator is out of these lights' focus sooner, and he can then pull to as near the side of the road as possible and see what he is doing most of the time.

An Engineering Basis for Taxation of Motor Vehicles

BY C. O. EGERTON AND S. A. FEKETE
Hudson Motor Car Co.

WITHIN the last 10 years the highway builders of this country and Europe have been compelled to make radical and costly changes in their methods of road construction. That these changes have been occasioned largely by the introduction of motor car triffic is undeniable, for the problem of economic construction and maintenance of roads for horse-drawn vehicles was satisfactorily solved approximately a century ago by English and Continental road builders.

But because motor car traffic has destroyed roads which successfully sustained animal-propelled vehicles, let us not indict it with wanton destruction of property until its side of the case has been fairly presented. If we were to take a typical motor car and a typical horse and wagon of equal weight and move them over parallel stretches of equally good roads at equal speeds until the road surfaces were no longer fit for economical use, we would probably discover that the roads would wear out at very nearly the same time. If one road lasted longer than the other, it would quite possibly be the road traversed by the motor car.

Actually, then, the cause of the increase in road destruction is due in the first place to the speed at which the motor car can move as compared with a horse and wagon; and in the second place to the increased volume of motor car traffic as compared with animal traffic. The cause for the former popular demand for a specific motor car tax arose probably from the fact that the motor car when first introduced was considered a luxury, while the horse and wagon have been regarded as necessities from time immemorial. At the present day, however, this distinction is certainly obsolescent if not obsolete. While it is essentially illogical that horse-drawn vehicles should be exempt from specific taxation, when they undoubtedly do their share of road damage, it is nevertheless a fact that motor vehicle users are the staunchest supporters of road extensions and maintenance, as well as the greatest beneficiaries therefrom, and as such should not escape a reasonable share of the expense so entailed, whether the cost is levied as a specific motor car tax or as one upon personal property. Assuming then that the motor car owner is to pay a reasonable tax, the amount of his contribution should be in direct proportion to the amount of damage which his vehicle is capable of inflicting upon the road surface.

There are three general classes of road surface to which we should give consideration in regard to their behavior under the action of wheels.

The first class, such as brick and concrete, which show comparatively little deflection under the action of rubber tires.

The second class, such as asphalt, macadam and bituminous macadam, which show some noticeable depression under wheel action.

The third class, such as gravel, earth and sand, which show very considerable depression under wheel pressure.

In other words, the surfaces are classified according to the approach of their materials toward theoretically perfect elasticity.

Roads of Hard Material

If we take the case of a concrete road or one of brick supported upon a concrete foundation, we have a condition closely resembling that of a beam uniformly supported from below and acted upon from above by repeated stresses. By simply making the depth of concrete sufficient the section subjected to stress will be able to sustain an almost infinite number of deflections without fracture. Consequently it would appear to be a practical impossibility to destroy an adequately constructed concrete road by rolling a loaded wheel over it.

If destruction exists, then it must be due principally to the abrasive action of the rolling body. Abrasive action being purely a function of the relative hardness and relative speed of the rubbing surfaces, it is obvious that an ordinary steel wagon-tire can do much more damage than a rubber tire for the following reasons:

A concrete surface consists actually of an almost infinite number of minute particles of sand and rock which project very slightly above the cement matrix in which they are embedded. The abrasive action therefore consists in either dislodging these from their bed or in crushing them. A rubber tire clearly cannot crush these particles, for being so much softer it is merely depressed by them, and dislodgement, while not impossible, is improbable since it would be liable to occur only when the tire has in addition to its rolling motion a slip relative to the road surface. Below the average legal limit of speed this slippage has been shown to be so small as to be almost negligible.

A steel tire in passing over projecting particles, however, has by virtue of its hardness the power to crush them. They then become powder, which is removed by wind, weather or other passing vehicles, leaving other similar particles exposed to subsequent similar action.

Legal and Practical Limits on Velocity

Nearly every state in the Union imposes a limit upon the speed at which a vehicle may travel over its roads. An average taken of the limits in thirty-eight states shows itself to be approximately 25 miles per hour.

It is clear that an average motor car has sufficient power to exceed speed limits fixed either by law or by general expendiency regarding life and maintenance of car. The question naturally arises at this point, there-

fore, why should we, as is now the general tendency, tax a man in proportion to the power of his motor when actually he must not only break the law to use the full power for which he is taxed, but also must shorten the life of his vehicle by so doing. But as we have previously stated, the destructive effect of a vehicle on the road at a given speed is measured by the resistance encountered at that speed; so that our measure of the destruction which a car can cause to a road will occur at the legal speed, which is 25 miles per hour.

Any road vehicle, then, should be primarily taxed in proportion to its road destructive power and hence in proportion to its road resistance at its allowable speed, and not at a speed in excess of that, even though the motor may be of sufficient horsepower to maintain a higher rate of speed.

It is not alone sufficient, however, that the vehicle should be taxed entirely in proportion to the road resistance. As is very evident, certain classes of vehicles use the roads a far greater number of hours per day, week, or month than do other classes, and the amount of work which they do in destroying roads is directly proportional to the relative length of time during which they are in motion on the roads.

The problem of determining an average of the number of hours per day spent by each class of vehicle on the roads is somewhat difficult. In this respect we will class vehicles under the heads of commercial and pleasure vehicles. Of the commercial vehicles, omnibuses use the roads the greatest number of hours per day.

General Conclusions

In justice to the road builder it would be well to establish lower limits of speed for vehicles of excessive weight per square inch of tire contact. This, in fact, has been done in some states, notably in Massachusetts and New York. At just what point these limits should be established could be determined by experimental means.

It would be logical to give consideration to some tax system bearing a more direct relation to road destruction than does the horsepower scale. Such a mode of taxation would in no wise work injustice either to the state or to the vehicle user and would tax the user in proportion to the total yearly road destruction of his car at legal speed. This road destruction could be calculated by some formula which takes into account the various items of weight, wheel diameter and type of tires.

While it is not entirely within the scope of this paper to derive such a formula, we may suggest one taking the general form here shown:

$$\text{Total tax} = \frac{W a}{r} V_m \times K \times \text{Tax rate per unit.}$$

In this formula

W represents the total weight of car.
a = Coefficient of rolling friction.
r = ½ tire diameter.
V_m = Legal velocity in miles per hour.
K is a factor proportional to the average number of hours per day which a given type of vehicle uses the road relative to the standard type on which the tax rate is based.

The value of a should be determined only after a series of exhaustive experiments.

To bring out more clearly the radical differences between the two systems of taxation, let us take a practical example.

Suppose we consider a touring car and a medium capacity truck. The monetary value of each is about the same. The touring car has a motor of the same bore, stroke and number of cylinders. The touring car has pneumatic and the truck solid tires. Under the horsepower scale both vehicles pay the same tax. If they travel over a road at the same rate of speed, however, it is hardly probable that they do the same amount of damage, and yet for this damage both must pay equally.

On the other hand, if we taxed each vehicle in proportion to the destruction each might cause to the road, each pays only for its share of the destruction.

Which system of taxation appears then to be more logical; the one based on horsepower or the one based on destructive power?

At the present time the formalities of truck tire merchandizing are limited to a guaranty of perfection in workmanship and a certain maximum cost per tire-mile. Also, each tire company has its own special list of permissible loads which each size of tire may carry. Without dwelling on the shortcomings of this happy-go-lucky method of dealing in tires, permit me to call to your attention that in the iron and steel world it is customary to buy and sell material which fulfills the requirements of certain chemical or physical specifications. The art has been perfected to such an extent that the measurement of the elemental subdivisions is now a matter of every-day routine in the up-to-date office, and moreover it is recognized that buying on specifications is the only sane policy—fair to both purchaser and seller. Standardization is not by any means limited to steel; Portland cement, paints, chemicals, electrical apparatus, boilers, etc., are all more or less thoroughly standardized.

Conclusion

In conclusion, I simply venture a general summary. The ideal disposition of truck tire standardization would be to prescribe standards of commercial properties to be attained when the tires are in service under standard road surface conditions; the variables under this scheme would be the tire details. However, inasmuch as it would be impracticable, to say nothing of being cumbersome, to test each tire for the values of the commercial properties, to determine whether they come up to standards or not, it would develop that once we have arrived at and defined a satisfactory condition in the matter of service performance, the simplest proposition would be to take cognizance of the physical properties of the tires themselves and standardize them together with the loadings, speed, and spring suspension.

Thrilling Trip to Center of Active Volcano in California

Native Sons Pay a Visit to Mt. Lassen

SAN FRANCISCO, CAL., July 3—Starting from San Francisco with the object of seeing just what Mt. Lassen, the latest acquisition to California's gallery of natural wonders, had to offer the motorist, a party of ardent motorists set out recently for the crater region determined to see the steaming mountain at close range.

In a trip which took 4 days and 4 nights to make, and which carried them over 600 miles of roads, which brought them from the torrid heat of summer Sacramento valley to the snow-line weather of the upper Lassen country, C. H. Gascoin, factory expert of the Maxwell company; Burleigh Davidson, publicity manager of the United States Rubber Co. of California; C. Spaulding Nordell and Harry Collier, in a Maxwell 25 succeeded in getting right into the heart of the volcanic disturbed mountains, and placed their car where a motor car never had been before.

Arriving in Red Bluff after a dash up the valley, the party made all haste to get away from the city, so as to cover the 56 miles which intervened between Red Bluff and the divide.

From Red Bluff the road to Mt. Lassen leads over a rough country to Payne's creek, 24 miles away, after which the real grind of climbing into the hills starts in earnest. The next point reached is Mineral, 20 miles further on in the foothill country. It is about a mile from Mineral where the Mount Lassen forest reserve station is located.

The first evidence of danger came to the motorists 2 miles from Mineral, where a family was moving out of the danger zone. On to Morgan Springs, 6 miles, and then another 6 miles of dangerous, painful toiling brought the tourists to their first camping spot. That evening at 6 o'clock one of the big eruptions of the crater took place and the motorists witnessed a spectacle, which once seen never can be forgotten.

After a night spent out under the stars at the foot of the mountain, the party prepared to make the dash for the nearest possible point to the crater the next morning. The work of clearing a path for the car over the ridge was such that but a few miles could be made that day. After a harrowing ride on the return trip the party arrived in Red Bluff, thence through Pleasant Valley and Vallejo, and from there by boat to San Francisco.

ARIZONA AFTER ROAD FUNDS

Phoenix, Ariz., July 5—Petitions for the initiation of a constitutional amendment providing for a $5,000,000 state road bond issue are being circulated in Arizona and the measure will be submitted to the voters at the general election in November. State Engineer Lamar Cobb, who has done splendid work with limited funds in improving the highways of Arizona, is the author. The proceeds of the bonds are to be spent by the state engineer and board of control, with the assistance of an advisory committee of five representative citizens named by the governor. Three-fourths of the fund shall be apportioned among the fourteen counties in proportion to their assessed valuation and the remainder will constitute a general fund. Some opposition to the bond issue has developed because it is thought unwise to spend $5,000,000 at this time.

The Readers' Clearing House

NUMBER OF LEAVES IN A SPRING

Formula for Calculating This—V-Type Radiator Advantages

ELKHART, Ind.—Editor Motor Age—What advantage has the V-type radiator over the ordinary?

2—What size side rails would Motor Age advise to be used for a car of about 1,500 pounds and 106-inch wheelbase?

3—Would 30 by 4-inch tires give longer wear and easier riding than 30 by 3 or 3½-inch tires on a 1,500-pound car?

4—Could forward and reverse speeds on a Ford be operated by one lever like a sliding-gear transmission?

5—What is the speed and gear ratio of the Carnation?

6—The Carnation has a tread of 48 inches. Would it use more fuel and be harder to handle on country roads than if it were fitted with 56-inch tread?

7—Could Motor Age give me a rule to calculate the number of leaves a spring should have according to the weight of the car?—W. E. Click.

1—The appearance of the V-shaped radiator is considered by many to be more pleasing than that of the flat type, it is thought that better cooling is obtained because a greater cooling surface may be exposed to the air and the wind resistance is cut down. These are the chief advantages.

2—Fair dimensions for such side rails would be 2¾ by 1¼ by ⅛-inch thick. The 1¼ inches refers to the top and bottom flanges.

3—The oversize tire would undoubtedly show a longer life, but the increase in riding qualities would hardly be noticeable.

4—It would be possible but hardly worth the trouble and expense.

5—The Carnation can attain a speed of 45 miles per hour. It has a motor to wheel ratio of 4 to 1.

6—It is a question whether the wider tread consumes more power.

7—The number of leaves necessary in a spring requires that a number of things be known about the metal to be used. This will be apparent from an analysis of the following formula:

$$N = \frac{5WL3}{EDBT}$$

Where N equals the number of leaves

W, the weight to be carried by the spring. For this you might take half the load over the front axle

L, the length of the spring

E, the coefficient of elasticity of the metal which may be taken as 28,000,000, but the figure varies with different metals

D, the deflection under load

B, width of the leaves

And T, the thickness of a leaf.

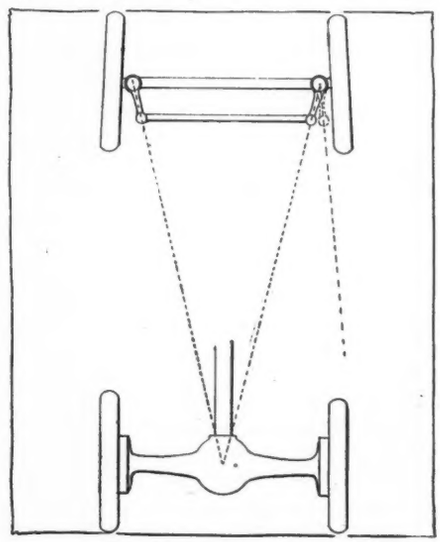


Fig. 1—Illustrating the Ackerman steering principle which means simply that the steering arms are in line with the central point of the rear axle

PRINCIPLE INVOLVED IN STEERING

Ackerman System as in Use Today Is Outlined

Jamestown, N. Y.—Editor Motor Age—What are the methods used in finding the tie rod bolt center position in relation to king bolt center on a front axle for both tie rod in front and tie rod in rear of the axle? Is the wheelbase and tread of a car of importance in finding these positions?

2—Should the front wheel toe in any at front, if so, how much?—C. Stumhofer.

1—Fig. 1 shows the Ackerman principle of steering, such as employed on all motor cars. It will be noticed that the steering arms are aligned so that their center lines intersect at the central point of the rear axle. This alignment is independent to some extent, of the wheel alignment, as both wheels may be correctly cambered and gathered, with one of the steering arms at a faulty angle. In moving straight ahead, this would have no effect, but in turning, the wheels do not run on a true circle, so that both wheels are subjected to a tire grinding. The same effect results from the tie rod being too short or too long.

To determine whether or not the steering connections are properly made it is necessary to know that the angle of the steering arms and the axle spindles is right, and that the tie rod is of the right length. Both of these depend upon the distance apart of the steering kingbolts and on the wheelbase of the car.

Given the wheelbase of the car, and the distance between kingbolt centers, the diagram may be laid out as in Fig. 1. Measuring the angles of the steering arms, as made with the axle, the correct angle that the steering arms on the car should make with the car axle is found. Frequently in lining up the wheels of a car, the steering connections are thrown out by lengthening or shortening the tie rod to get the proper gather. This should never be done, as improper gather is usually the result of bent wheel spindles. The tire wear resultant from bad wheel setting is obviated at the expense of a serious wear on account of faulty steering. This is made clear in the illustration in Fig. 2.

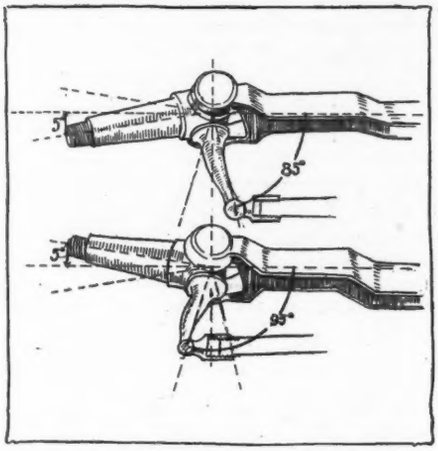


Fig. 2—Illustrating the wrong method of setting the steering arm, thus causing excessive tire wear

2—The usual figure is 2 per cent of the wheel diameter.

HOW TO CLEAN OUT A RADIATOR

Washing Soda in Boiling Water Is Good —Special Compounds

Freeport, Ill.—Editor Motor Age—Kindly suggest something which will clean out the radiator of a Selden Type 47 car, which has become clogged. Have tried soda without effect.—J. E. H.

The proper solution to use in cleaning out a clogged radiator depends upon what particular impurity has clogged it up. Usually this happens through a deposit of solid material from the cooling water which forms on the interior of the entire cooling system. Soda quite frequently will dissolve this, but some deposits do not respond to this treatment. The situation is the same as that of steam boilers and some of the boiler compounds probably will be valuable. It is suggested that you send a sample of the water employed to a water compound manufacturer who can then, upon analysis of the water, determine the proper cleaning compound to supply.

There are a number of radiator cleaners manufactured specially for motor cars and

Questions Answered and Communications Received

W. E. Click	Elkhart, Ind.
C. Stumhofer	Jamestown, N. Y.
L. V. Denwan	Hudson, Wyo.
R. Kramer	Ackley, Ia.
J. Becker	Bode, Ia.
J. E. H.	Freeport, Ill.
E. B.	Nitta Yuma, Miss.
E. W. Slavis	Morrill, Kan.
Rafael Vives	Ponce, B. C.
S. A. Traeger	Minneapolis, Minn.
P. Waggener	Festus, Mo.

No communication not signed with the reader's full name and address will be answered.

they may be beneficial. The following are taken from the Automobile Trade Directory:

C-R Supply Co., 410 Elm street, Ottawa, Kan.; Colza Chemical Co., Mutual Life bldg., Buffalo, N. Y.; Cortland Specialty Co., 176 Railroad street, Cortland, N. Y.; Field Auto Compound Mfg. Co., Auburn, Me.; Garratt-Callahan Co., 37 S. Clinton street, Chicago, Ill.; G. Walker Gilmer, Jr., 52 Seventh street, Philadelphia, Pa.; Hall-Thompson Co., Hartford, Conn.; Milwaukee Auto Specialty Co., 705-15 Chestnut street, Milwaukee, Wis.; Sutherland & Co., 232 Milk street, Boston, Mass.; U. S. Compound Co., 1425 Seneca street, Buffalo, N. Y.

Trouble With Scored Cylinder

Hudson, Wyo.—Editor Motor Age—I have one cylinder scored, perhaps the thickness of a sheet of paper. Will this be of any particular detriment, or should cylinder be rebored?

2—What would cause scoring when rings and pistons apparently are properly fitted? Also plenty of oil supplied.

3—Are new rings liable to score, although properly fitted?

4—How much space should be provided in rings to allow for expansion?

5—I have an extra set of pistons larger than bore of cylinders. Could cylinders be bored to fit these pistons?

6—What is the usual charge for reboring four 4⅛-inch cylinders, and fitting new pistons and rings? What would be the cost of boring only?—L. V. Denwan.

1—The scoring probably is not bad enough to require reboring. Use graphite in the cylinder oil.

2—The rings probably were not properly fitted.

3—No.

4—⅛ inch.

5—If not over ⅛ or $\frac{3}{16}$ inch larger.

6—From $7 to $15 per cylinder.

READER'S MOTOR GETS TOO HOT

Evidently Due to Carbon Deposit—Piston Rings May Be Worn

Ackley, Ia.—Editor Motor Age—I have a 1910, model R, Reo which overheats. It will steam when driven 8 or 10 miles. Would too much oil cause this, as it smokes very bad at the exhaust? Will Motor Age kindly give a remedy for this, as I cannot find any place where the oil leaks?—R. Kramer.

The use of too much oil for any length of time will cause carbon to deposit on the piston and cylinder head and thus cause the motor to heat. If misfiring is evident and loss of power, then treat the motor as one badly carbonized. However, the heating may be due to other things besides carbon. The motor should not be operated with the spark retarded too far, and the brakes should not drag. The water system must, of course, be free from obstructions. If the pistons are poorly fitted or the rings worn excessively, the oil will work up into the combustion chamber, deposit carbon and cause heating. Try to do as little intermediate and low gear work as possible.

Notice to Readers' Clearing House Correspondents

Motor Age has received communications addressed to the Readers' Clearing House from the following named towns and nom de plumes:

Madison, Wis.....A Subscriber
Battle Creek, Mich.....A Reader
North Lawrence, O.....Amateur
.....Albert Ghnotto
Calvert, Tex.....A Reader
New London, Wis.....A Reader
Chicago, Ill.....A Reader
New Orleans, La.....Bruce
Burns, Kan.....A Reader
Crystal Falls, Mich.....Reader
Kellogg, Ida.....W. M. L.
Belle Plaine, Ia.....A Reader

These communications will be held until the proper signatures have been received. All communications written over a nom de plume must bear the writer's signature, otherwise, such communications will not be answered. These signatures are wanted as proof of the authenticity of the inquiries.—Editor Motor Age.

MEANING OF HORSEPOWER RATING

S. A. E. Formula Considers Bore Only. Essentials of Disk Clutch

Nitta Yuma, Miss.—Editor Motor Age—Kindly explain the meaning of this. A car rated at 25 horsepower and developing 96 horsepower.

2—I see one of the racing cars with one cylinder. Does this make up in size what it lacks in units?

3—I am interested in the cyclecars and like the air-cooled motor idea and prefer the shaft drive. I am under the impression the 36-inch tread requires tandem seating.

4—Is the clutch of the disk type if the car is managed by the clutch coming against a round flat piece of metal?—E. B.

1—The horsepower rating does not necessarily indicate the maximum power it may develop. The rating is based only on the diameter of the bore. The actual power depends on many other things, such as: length of stroke, crankshaft speed, weight of the reciprocating parts, size and lift of the valves and the design and workmanship throughout.

2—To some extent.

3—Narrow-tread cyclecars usually are tandem seaters.

4—No. The disk clutch consists of a series of metal plates, face-to-face, alternate ones being connected to the engine and the others to the transmission. When these are pressed together by a spring, they all turn together. The device you refer to is the clutch brake to keep the clutch from spinning.

POWER LOSS DUE TO MUFFLER

At Ordinary Running Speeds Cutout Shows Little Gain

Bode, Ia.—Editor Motor Age—I have a Studebaker 4 which has no cutout. Would the engine have more power if one was put on?—J. Becker.

1—The power loss due to the muffler varies as to the r. p. m. increases and Fig. 3 shows two horsepower curves of a four-cylinder motor one taken with the muffler on and the other with the muffler removed. In one test made by the Jeffery company on a Rambler the following results were obtained:

R. P. M.	Horsepower: Muffler on	Horsepower: Muffler off	Loss
600	17.6	18.9	1.3
700	20.0	21.5	1.5
800	22.3	24.0	1.7
900	24.3	26.2	1.9
1,000	26.1	28.1	2.0
1,100	27.5	29.7	2.2
1,200	28.6	30.9	2.3
1,300	29.3	31.8	2.5

If the muffler is one of excellent design the losses may not come as high as indicated below and in a modern car, operating at an average speed of 20 miles per hour, the loss is very slight.

WHY A SPARK COIL IS NECESSARY

Transforms the Low-Tension to High-Tension Current

Minneapolis, Minn.—Editor Motor Age—Kindly explain the duties of the coil.

2—How often does a magneto have to be remagnetized?

3—When the spark on my car is retarded it misses considerably. Is this a sign that the magnet is weak?

4—Is the Lippard-Stewart truck still being made?

5—What name is it sold under?

6—What is the most widely used carbureter on the market today?—S. A. Traeger.

1—It is taken that you mean a transformer coil used in connection with a battery or magneto, for ignition. Such a coil is used to raise the voltage of the initial low-tension current. A low-tension magneto or storage battery generates current of such low pressure that it will not jump the gap in the spark plug. In order to make it jump the gap the current is passed through a coil inside another coil and while it is passing through it is suddenly interrupted. At the moment of interruption a high-tension current is induced in the outside coil. This high-tension current is passed on to the spark plugs.

2—Much depends upon the conditions under which the magneto operates. Once each year appears to be the average period.

3—No. Retard and advance simply refer to time of spark occurance. The spark is just as strong on retard as it is on advance. When the spark is retarded it means that it occurs when the piston is going downward and when it is advanced it occurs when the piston has not yet reached dead center.

4—Yes.

5—It is still being made and sold under the name of Lippard-Stewart.

6—This is hardly answerable without knowing the output of each carbureter manufacturer and this is not obtainable. The Holley and Kingston used on Ford cars should be well up in front.

Finds Electric Polisher Maker

Festus, Mo.—Editor Motor Age—I read in April 30 issue of Motor Age where Mr. Grimm of Chicago inquired as to where he could get a portable electric polisher. The United Mfg. Co., 1051 Commerce Trust Bldg., Kansas City, Mo., manufacture one.—P. Waggener.

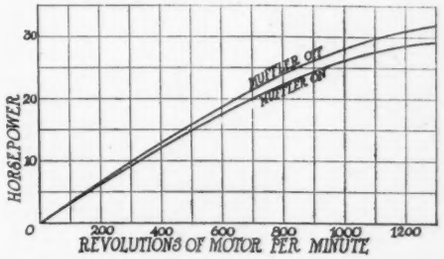


Fig. 3—Curves showing the power lost by the use of the muffler. These curves represent test results from one type of car. The more modern mufflers show little loss at average running speeds

King Reduces Price for 1915 and Increases Motor Bore

Wheelbase Lengthened—Chassis Much Improved

WITH a number of constructional refinements, with a reduction in price and clothed in a very beautiful streamline type of body, the 1915 King has come forth. In appearance the new King bears little resemblance to last season's model, although many of the mechanical features are retained.

The 1915 series, known as model C, comes in roadster and touring form, and the application of the Ward-Leonard cranking and lighting system is optional, as it was last year. With this equipment, the new price with either body, is $1,165, as compared with $1,195 last year, when similarly equipped. The price without these electric features is now $1,075, or $20 less than previously.

The most important change mechanically is the addition of $\frac{1}{16}$-inch to the bore of the cylinders, making them $3\frac{15}{16}$-inches in diameter, the stroke remaining as it was at 5 inches. This adds materially to the power output, although the manufacturer's rating has been left at from 30 to 35 horsepower. The S. A. E. formula accords his motor 24.8 horsepower, which is of little value with the long-stroke design.

In bringing out the new bodies, the King designers are to be specially commended. The pure streamline effect is obtained, and gives a grace of line which should make the passerby stop and take a second look. The latest idea from Europe is incorporated in that the upholstery is placed entirely inside the body.

THE 1915 KING TOURING CAR, WHICH SELLS FOR $1,165

FEATURES OF THE 1915 KING

More powerful motor

New price, $1,165, with electric equipment

Motor bore $3\frac{13}{16}$ instead of $3\frac{3}{4}$ inches

Cantilever rear springs slightly modified

Wheelbase 113 instead of 112 inches

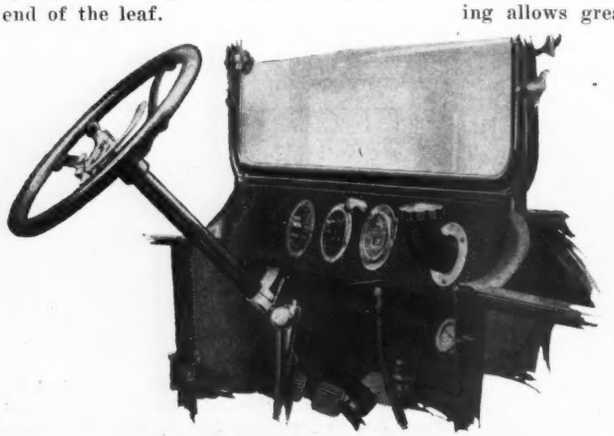
Cowl gasoline tank

Rear Springs Modified

Although retaining the cantilever gear springs which have always been a characteristic feature of King cars, a modification has been made in the manner of attaching their rear ends to the axle housing. The former plate-and-sleeve construction on the axle housing has given way to a hinge form of attachment. A sleeve around the housing has two eyes, an eyebolt running through these and an opening in the end of the lower leaf of the spring, this being made by turning up the end of the leaf.

In connection with this spring-mounting change, the forward end of the torque tube is attached to the lower side of the gearcase by a sliding bracket which allows free end play to the torque tube while at the same time it prevents injury to the end thrust bearing in the universal joint due to side thrusts occasioned by changes of position of the outer ends of the rear axle in conforming to the irregularities of the road.

This construction and spring mounting allows greater flexibility and is said to afford still greater ease in riding. The former construction was the attachment by plate and bolts to a sleeve on the rear axle which was free to play longitudinally on the housing and was held in place by flanges on either side. The forward end of the torque tube was formerly not attached to the gearcase, but was free to move on the propeller shaft by which it was supported.



DASH VIEW OF THE 1915 KING

The wheelbase has been lengthened 1 inch, to 113 inches, while a pressed-steel housing now is provided to replace the cast type formerly employed. This new housing is 50 pounds lighter. The axle itself is of new form, in that a pure floating construction supersedes a three-quarter floating one. The brakes, too, have come in for some change to make them simpler and more efficient. Here and there other refinements have been incorporated whiel will be taken up in detail later.

The general construction of the L-head engine has not been changed.. The motor is three-point suspended from the main frame, the clutch and gearset being in unit with the crankcase, as in general practice for unit power plant design. The crankcase, of aluminum, is horizontally split into halves, the upper half, to which the cylinder block bolts, carrying the three main bearings of the crankshaft, while the lower part takes care of the oil reservoir, and the splash troughs for the connecting rods.

Manifold Construction

Both intake and exhaust manifolds are separate from the cylinder block, and bolt to it rigidly. There is an individual opening into the exhaust header from each exhaust port, while in the case of the intake, one opening into the block takes care of the distribution internally to two intake ports. One manifold change is the shortening of the intake and causing the Stromberg carbureter to be mounted higher. This is made possible by the location of the fuel tank in the cowl and makes the carbureter more accessible, besides tending to greater mixing efficiency since there is less pipe length for condensation. The carbureter is a Stromberg of latest design.

Timing gears are spirally cut and housed at the front end of the engine. There is

only one exposed shaft, that being on the right and driving the fan through belt connection, the ignition distributor and the generator, when the latter is supplied.

Cooling is well taken care of by a honeycomb radiator, which replaces the formerly-used vertical-tube type. It is more efficient and its appearance very attractive, the front edges being coped over in line with present day fashions. The system is of the thermo-syphon type, the inlet and outlet connections to the cylinder block being large enough to permit of free circulation. The inlet connection to the block is at the front right side.

Uses Flywheel Oil Pump

Lubrication is a combination of force feed and splash, the flywheel acting as a pump and forcing the oil to the crankshaft bearings and the timing gears. It dips into the oil and as it revolves throws any which clings to the rim into a scoop or trough by centrifugal force. Thence it goes to the bearings. The cylinder walls and pistons receive the splash from the connecting rod ends dipping into the splash troughs, there being an individual trough for each cylinder.

Ignition has been completely changed. The magneto used last year has been replaced by the Atwater-Kent battery distributer system. The distributer with this system is mounted where the magneto formerly was placed, and is driven off the end of the fan and generator shaft. The chief advantage set down for this change is that there is a gain in flexibility at low speeds due to the fact that the current supplied by the battery is constant at all times.

The cranking motor and the generator are of the Ward-Leonard make, being separate units. The generator is mounted below the ignition unit on the right side of the engine, driven by a silent chain from the shaft. This chain is uninclosed, and allows the ready removal of the generator if necessary. Generation of current reaches its full amount at from 10 to 15 miles an hour car speed, the generator being driven at twice engine speed. A Willard 80 ampere-hour storage battery receives the current in the usual way, a special controller keeping the battery charged fully and prevents too rapid charging, at the same time allowing full rate at the car speed above mentioned.

The cranking motor unit is placed at the right side of the gearbox to which it is bracketed. The bracket has been simplified and strengthened, while the electric motor itself is a more powerful one than its predecessor. It is capable of turning the engine at from 135 to 140 revolutions a minute, as compared with yast year's speed of 90 revolutions. The reduction gearing between it and the flywheel has also been simplified, one of the intermediate gears having been eliminated.

The starter control has been improved, a lever between the front seats at the driver's right and operated by pushing forward taking the place of the old pull-up handle. The system is a two-wire type of 6 volts. There are large and small bulbs in the head lamps for city and country driving.

A change has been made in the multiple disk clutch also. Instead of the disks being faced with an anti-friction material as heretofore, they are now provided with cork inserts, there being nine bronze disks and an equal number of saw-steel disks. These were all steel last year. The new clutch is very easy in action and all jerking is forgotten.

The gearset has the usual three forward speeds, but it has also come in for some of the refinement. The gears are all made of chrome nickel steel, as compared with a combination of carbon and nickel steels on the older models. Ball bearings have given way to Hyatt spiral rollers throughout the gearset, while another change is the improvement in the gearshifting mechanism. A ball-and-socket lever controls the shifting instead of the cross type that was used before.

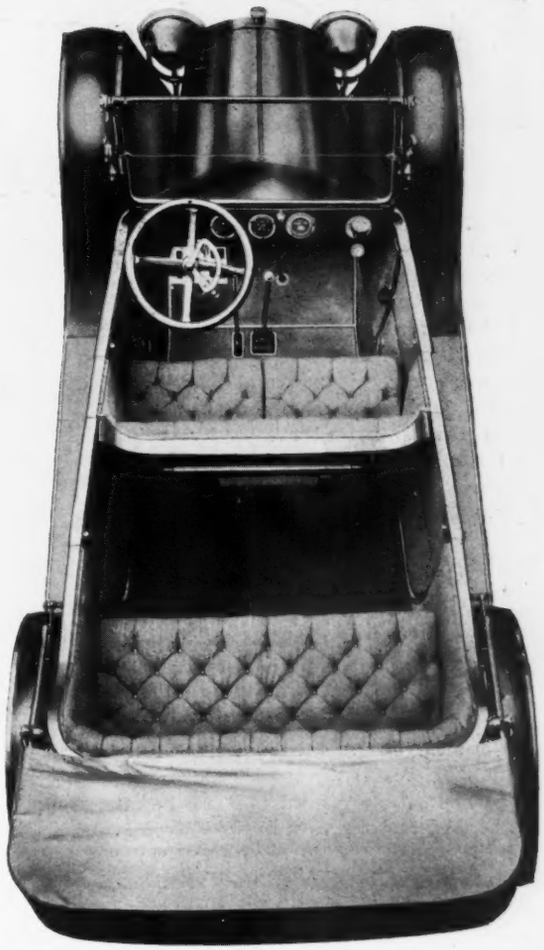
The drive to the rear is through a propeller shaft inclosed within a torque tube, as has already been mentioned. The universal joint is placed at the forward end and with the new mounting of the tube at the front end, most efficient conveying of the power to the rear unit is obtained. Option of either a 3.7 to 1 or a 4 to 1 ratio in the axle is given.

In simplifying the brakes, they have also been made more powerful. The internal brake bands have been made of full-wrapping type as compared with last year's semi-wrapping form.

Details of the Body

In clothing the new model C cars in the streamline type of body, the lines have been so formed that a longer appearance is given. This is specially true from the cowl to radiator, which is of the rounded top form to sweep gracefully into the cowl.

The gasoline tank is placed in the cowl as is well-nigh a majority feature these days. This tank holds 12 gallons of fuel, and the filling is done at the right side, the cap being so placed as not to interfere with either occupant of the front seat. A gasoline gauge also is provided. Last year's King had the gasoline tank under the front seat. Although the body gives the idea of narrowness and streamline effect, the rear seat is really 3 inches wider than that of the previous model. It measures 46 inches across.



SHOWING THE SPACIOUS TOURING BODY ON THE 1915 KING

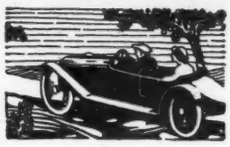
In line with the other body trimness, the fenders are crowned and conform closely to the contour of the wheels. The instrument board containing gasoline gauge, electric light switches, ignition switch, speedometer, and speedometer light is another new feature.

A notable manner of clearing the running boards of any obstructions is found in this new model. The storage battery is placed under the front seat at the driver's right, the tool box being located under the drive seat. These are therefore both very accessible, while the space under the rear seat is left for luggage.

Tires are 33 by 4 front and rear. Steering is on the left, the gear being of Gemmer make, and operating through the use of an 18-inch wheel. Cast aluminum spark and throttle levers on the wheel are a new thing in motor car construction, these being usually made of steel and nickeled. These aluminum controls naturally cannot tarnish, and are amply strong. The horn button is conveniently located in the center of the steering column above the wheel.

The equipment takes in everything now demanded by the driver. There is a rain-vision windshield, silk mohair one-man top, quick detachable side curtains, Stewart speedometer, electric horn, demountable rims with one extra, and a complete outfit of tire tools, machine tools and jack.

Cyclecar Development



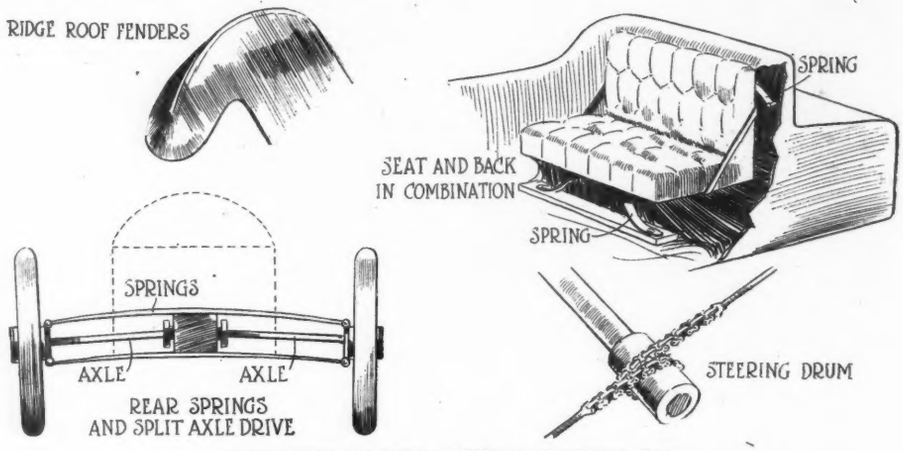
Tendencies in Cyclecar Design

THE cyclecar motor can as well be quiet as not. The narrow-tread cars take so little power to drive them that one does not need speed cams and valve lift to get all the power necessary. A car that will do 40 miles per hour and keep it up without overheating is powerful enough for hilly conditions as well, and has all the speed that is needed except for racing. The motor should be a high-speed type preferably, with large bearings and big valves with the greatest attention paid to balance. Bad balance is an absolute bar to high-speed work, irrespective of valve size or lift.

Tendencies today seem to be toward a four-cylinder motor and water-cooled. In going to motors of this type several makers have adopted power plants above the cyclecar dimension. This is not necessary as a 71-inch power plant in a light chassis, as built at present for the V-type motors, has ample power for all the speed that can be used and for very heavy hill work. There is no need for bigger motors but for less fussy ones, easier starting ones, engines that can be crowded for extended periods without overheating.

For high-speed work and even cooling there is nothing like an overhead valve construction, and this, with a well-thought-out cam action running in oil or grease, and with all working parts inclosed, should run very quietly. The head can be removable and make the valve grinding easy and at the same time allow of bigger valves than when there is no parting line at this point. This construction is seen in the new Maxwell racers built by Ray Harroun. The crankshaft on these cars is worth looking at as a perfectly balanced job. Though too expensive for cyclecar work, it gives an idea of how carefully-thought-out balance details should be for high-speed work.

There is as yet some confusion on the carbureter problem as related to small four-cylinder jobs, and this is a field for an experimenter which offers good returns.



FEATURES OF THE CORNELIAN LIGHT CAR

Since the cyclecar is low-built there is need for side protection from mud thrown from passing cars, hence there is a tendency to put much side surface on cyclecar bodies, some of them having more body metal surface than two-seater big cars. The weight and cost of this side surface can be done away with in a measure in the sporting types by building racer lines, with bucket seats staggered, and wide fenders and running boards to do the dust-proofing.

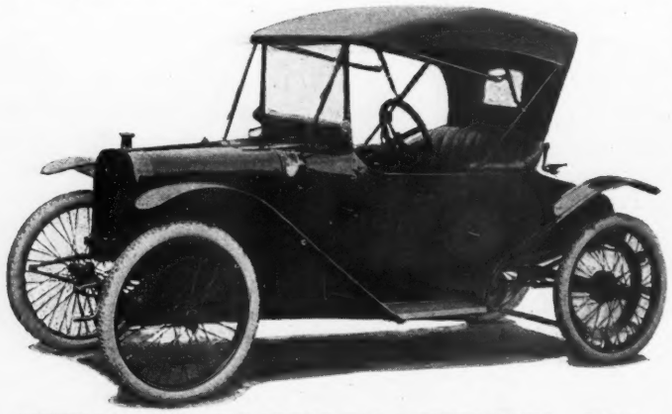
While cyclecar conditions are more or less chaotic at present, it is from this stage that the real cyclecars will come, arising phoenix-like from the ashes of first experiments, the ashes of good money burnt in a good cause.

EXPERIMENTAL ZIP TRUCK

The Zip Cyclecar Co., Davenport, Ia., is using an experimental Zip truck in the truck service at the factory. This car is on the go all day long and being used for experimental purposes, is given all kinds of abuse every day. It is a common sight to see it heavily loaded with castings and this truck takes care of the largest percentage of ordinary hauling required.

The company considers this truck service work a very good test as it demonstrates the durability of the construction. While the company is not as yet building a commercial vehicle, plans to that end are being made on the basis of the results of this experimental car. A light commercial truck is contemplated for the near future, although it will probably not be placed on the market before the first of August or September.

At the present time, the Zip factory is a very busy place building and delivering passenger cars. The passenger cars are now being built and delivered at the rate of four per day, although the demand will make it necessary to increase the production to six cars in the next few days. The Zip factory has also doubled its floor space by additions recently made to the plant.



CORNELIAN LIGHT CAR WHICH HAS A SHEET STEEL BODY

GEMCO CYCLECAR PARTS

Parts for cyclecars recently have been been made an important part of the line of the Garage Equipment Mfg. Co., Milwaukee, Wis. The Gemco cyclecar parts are being really pushed and a parts catalog has been issued. The concern carries the following cyclecar parts: windshields, lamps and lamp brackets, mufflers, control levers and pedals, steering gears, axles, driving pulleys and hood fasteners.

The latest and most important addition to the line is the shaft-drive rear axle. These are made to suit any width of tread from 36 to 56 inches and the propeller shaft and torsion tube are made to any length to suit the customer's requirements. The differential housing and brake spiders are cast aluminum, well ribbed for strength, as is the pinion housing.

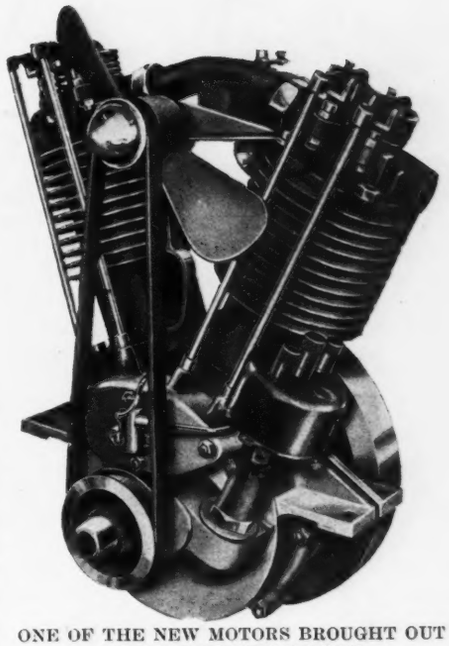
Brakes are single internal, and are faced and expand into pressed steel drums. The gear ratio is about 4:00 to 1. The pinion is backed up by a New Departure double row combined radial and thrust bearing. Hyatt roller bearings are used for the drive shaft; the axle is intended for use under cars weighing 1,000 pounds or less. The

Garage Equipment Co. also is bringing out a two-speed sliding gear transmission for cyclecars, details of which will be forthcoming later.

SERVICE CYCLECAR MOTOR

The Rochester Motors Co., Inc., Rochester, N. Y., has brought out two types of cyclecar engines which are alike in every respect except that one is air-cooled and one is water-cooled. On account of its lower weight, the company shows a preference for the air-cooled type and states that the air-cooled engine will run idle at the curb with no more heating than a water-cooled engine. This company has built small engines for 25 years and its experience should be worth something.

The engines are two-cylinder, V-type, 3⅜ inches bore and 4 inches stroke, rated by the factory at from 9 to 12 horsepower. Cylinder heads are removable and valves are of large diameter and of tungsten steel. Main bearings are of the heavy-duty ball type and connecting rods have especially designed roller bearings.



ONE OF THE NEW MOTORS BROUGHT OUT BY ROCHESTER CONCERN

Cornelian Has Body and Frame a Unit

NO vehicle has been brought out through the inspiration of the cyclecar movement which has more originality or more features of real interest than the Cornelian light-cyclecar, made by Blood Bros., Kalamazoo, Mich., and designed by Howard Blood.

This car, while above the cyclecar definition in weight and motor size, is, in spirit, at least, a cyclecar, and classes under the second division, being called a light car by definition. The car weighs just over 900 pounds, has a 95-inch cylinder capacity motor, four-cylinder, water-cooled, two-speed gearset, shaft drive, differential, and all car features, being of standard tread. Yet by refinement of design, the parts and mechanism have made the car wonderfully simple and comfortable. The features are worth more than mere mention.

In the first place, the body is formed of sheet steel in such a manner that it forms both body and frame, at the same time very strong and roomy with very pleasing lines. Driver and passenger sit side by side in a wide seat with no necessity of crowding.

The seat itself is made in a new way, the back and seat proper being sprung together so that the rider's back is not continually rubbing against the cushion, but the back moves too. This seat is hung on flat springs underneath. Further springing is obtained by the method of car suspension, for the car is hung on cross springs fore and aft. These are long and resilient, as allowed by the standard tread width, and are fastened to the body proper. At the rear there are three cross springs so that radius rods are done away with, the three springs forming a triangle with considerable fore and aft strength. The bevel-gear reduction and differential are held in a housing at the center of the springs, and shafts, connected by leather universal joints run from this to the hollow hubs of either wheel, the outer universal in the wheels being at the extreme outside of the hub, in the hub cap, thus leaving the shafts as long as possible to give the minimum angularity.

The gearset of this car has been described before, and gives two speeds and reverse with but three gears in the makeup. These are two small spurs and an internal gear, which, altogether, make a very light and compact arrangement. The controls are simple and standard.

The fenders are new in shape, self reinforcing, and have been named "ridge roof fenders" by Mr. Blood. These have a very small wind resistance and by their shape, with a definite edge, are quite efficient. The steering gear is arranged with a roller chain wrapping about a drum at the front of the car, fitted with springs at either end of the rods connecting to the chain, and while not entirely irreversible are sufficiently so that road shocks do not tend to affect the wheel.

The motor used is a four-cylinder 3¾ by 4-inch, fitted with automatic spark advance and very efficient. The motor has more power really than is needed, the car making over 50 miles per hour and holding the road with no difficulty at that speed. There are very few occasions where low gear is used, it is claimed.

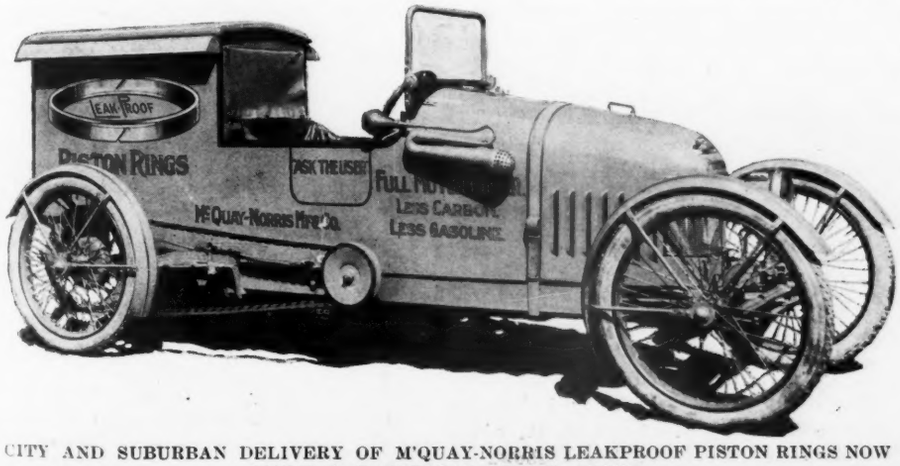
A ride in the car over boulevards and very rough roads with mud in spots showed a remarkable comfort, a real sense of safety at speed and cleanliness equal to that of the larger cars. The acceleration was exceptionally good. The car made a run from Kalamazoo to Chicago a few days ago, a distance of 178 miles, in 8 hours, having no mechanical trouble and no punctures.

FOR LOCAL DELIVERIES

Adaptability of the cyclecar to city and suburban delivery service has been successfully tried out by the McQuay-Norris Mfg. Co., St. Louis, Mo., maker of Leak-Proof piston rings. The McQuay-Norris company found that they had to take some such action to facilitate delivery of their orders. The parcel post proved far too slow to be of much assistance and the local express service was found equally unsatisfactory.

The city and suburban towns are now taken care of by this rapid cyclecar service, and although the car has only been in commission a short time, its usefulness has been abundantly demonstrated to the company. The use of the parcelcar helps to increase local sales by supplying local trade quickly.

The McQuay-Norris company has proved itself among the pioneers in the use of the cyclecar for delivery service, and the neat, trim little parcelcar shown in this illustration on this page with its uniformed driver, buzzing busily through the streets of St. Louis or along the suburban highways, has occasioned much interest and comment from pedestrians.



CITY AND SUBURBAN DELIVERY OF M'QUAY-NORRIS LEAKPROOF PISTON RINGS NOW MADE IN PARCELCAR SHOWN ABOVE

The Accessory Corner

Double Spark Plug

IN order to produce two sparks in the same cylinder at the same time the Power & Efficiency Co., Trenton, N. J., has brought out a double spark plug, shown in Fig. 4. This plug when connected with an ordinary plug causes the current to go to the gaps of both plugs and thus cause two sparks to occur, thereby increasing flame propagation and hence power. This type of plug will give increased power in a T-head or L-head motor, although the increase in the latter type will not be as great as in the T-head. The insulator is shaped to form a double V, the sides of the larger V being slightly concave and the smaller V being in the center and ending in a sharp point. This construction is said to cause the points to be cleaned by the gas. The insulator is carried to a point very near the spark gap in order to prevent any short circuit to the shell of the plug. The keeper B, in Fig. 4, may be used to carry the current to ground after it has jumped the gap, and in this way the action is the same as an ordinary plug. By removing the keeper and attaching a wire in its place, the other end of the wire connecting with an ordinary plug, each plug will fire. The plug sells for $1.

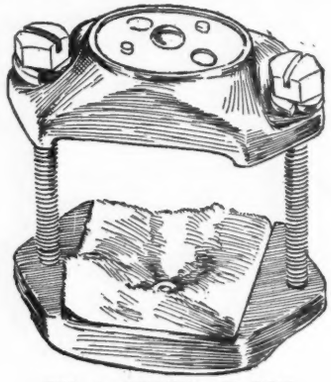


FIG. 1—BROWN OIL BOX

This device is clamped around the spring of a car as shown in Fig. 2 and it thus feeds oil from the felt pads to the leaves of the spring

Ajax Dimmer

Most of the dimming devices brought out recently are applicable only to electric headlights, but the Ajax, made by the Wanner Mfg. Co., Chicago, is designed for use on acetylene burning lamps and consists of a disk of dull-finished steel interposed between the burner and the reflector. The disk is fitted to a thumb screw clamp attached to the base of the burner and when it is desired to dim the lamps the thumb screw is loosened and the disk turned so that it lies between the reflector and the gas light. The Ajax, shown in Fig. 3, sells for $1 per pair.

St. Louis Rectifier

With small storage batteries in use on most of the vehicles the necessity for a small charging plant is almost imperative unless the equipment is taken care of by a garageman or a starting and lighting generator is used. Even in the latter case it is advisable to charge the battery from an outside source occasionally and hence a battery charger such as brought out by the St. Louis Electrical Works and illustrated in Fig. 5 is desirable. This device permits of a battery being charged from an alternating current line and is very simple to operate. The attachment plug is fastened to a lighting socket and the leads from the rectifier attached to the battery. The control switch is then closed and the charging begins. The 6-volt, 6-ampere size to be operated from a 10-volt, 60-cycle circuit sells for $20 and weighs 14½ pounds.

FIG. 3—AJAX DIMMER FOR ACETYLENE LAMPS

The first two illustrations show two views of a lamp with the dimmer set and the last with the dimmer out of position. The dimmer itself consists of a disk of dull finished steel which is interposed between the burner and the reflector

FIG. 2—BROWN OIL BOX INSTALLATION

One set of these may be used and shifted around from spring to spring. A small hole in the box houses oil which feeds the felt pads

Brown Oil Box

Now that spring lubrication has come to be understood by motor car owners as the means of eliminating squeaks and getting easier riding, many concerns have brought out leaf lubricators. The latest form of oiler announced is that called the Brown oil box, manufactured by the Brown Trailog Co., Cleveland, O., which consists of two metal boxes shown in Fig. 1, with felt pads in the compartments. These boxes are joined by bolts and when the felt is saturated with oil and the boxes clamped to the spring leaves as shown in Fig. 2 the lubricant feeds between the leaves, it is claimed. In order that the pads will be supplied at all times with oil, a small compartment behind the pad is used as an oil reservoir. Oil may be poured into this reservoir through a hole on the outside of the box. The movement of the spring leaves while in service causes the oil from the pads to work between the leaves from both sides and in time the entire leaf surface is covered with a thin film of oil. The prices range from 80 cents to $1.65 each, depending upon the size.

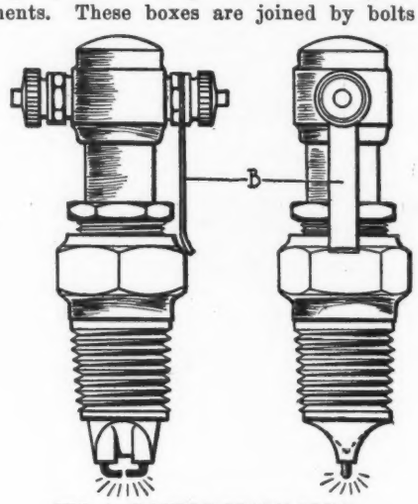


FIG. 4—DOUBLE SPARK PLUG

This plug may be used as an ordinary one by leaving the keeper B as shown at the left. By removing the keeper and attaching a wire leading to a regular plug two sparks occur in the cylinder at once

FIG. 5—ST. LOUIS RECTIFIER

A simple instrument operating from the lighting circuit which permits batteries to be charged from an alternating current circuit

The Motor Car Repair Shop

SQUEAKS, rattles and drumming sounds coming from a car, especially a new one, cause the owner much annoyance and at times makes him believe something is essentially wrong with the mechanism. Women especially hear these noises and repeat continually that something is going to happen. One of the most bothersome noises comes from a loose mud pan and when going over a slightly rough road the pounding of the pan against the frame sometimes frightens one. The pan is held in place usually by bolts and nuts. These may need tightening every 1,000 miles. Fender squeaks, for which the springs are sometimes blamed, may be removed by squirting a little kerosene between the frame and fender. Often the speedometer flexible cable is allowed too much slack and when turning a corner or driving over a rough spot the cable will slap against some under part of the car. The cable should be securely fastened so that the bends are long and sweeping and not abrupt so as to interfere with registrations.

Many cars with cowl fuel tanks emit an irritating sound which becomes louder as the tank is drained of fuel. The owner will wonder why he hears a noise after having traveled 100 miles and none when he started on the run. Keep the tank full is the remedy. Spring squeaks, of course, follow many owners and the only safe remedy is to lubricate the spring leaves and the shackle bolts. Grease cups are provided at the shackles and these should be given a turn each day.

Door squeaks sometimes are caused by pulling the top straps too tightly. This causes the doors to bind and when going over a bump there is a disagreeable squeak heard. A loose horn will cause a rattle as will a loose part of the horn. The starting crank sometimes is free to swing and when the car is moving over rough roads the crank swings and consequently may emit a squeak or rattle. Loose wheel spokes or rims, not sufficiently tightened, will give squeaking or creaking sounds sometimes difficult to locate.

Lubricating the Chassis

Very often the brake rods or other rods running underneath the car will slap against each other or against some other metal part. Rod rattling is heard when a car takes high car tracks at a fairly good rate. It is a simple matter to locate most of these sounds by having one person drive and another sitting on one of the forward fenders. While the car is going, the horn should be grasped and held tightly. If a rattle disappears then blame the horn. The hood should be felt, for very often it vibrates excessively. By placing the hand on a door one can feel it move backward and forward with the distortion of the frame. If the top is drawn too far forward squeaks result. A very common mechanical part squeak in these days of electric equipment, comes from dry generator brushes, which are pressing too tightly against the commutator. Take out the brushes and place a drop or two of kerosene on the rubbing surfaces.

What and When to Oil

System in lubricating the parts of a motor car is the only thing required to keep all the working parts in good order for a long period, and very few owners take the trouble to go over their cars at certain periods to oil or grease them. The following table gives a list of the various parts which require lubrication periodically. The parts are named and the kind of lubricant to be used is designated. The illustration on this page will help the owner locate certain parts, and although the chassis illustrated gives the parts in general, there may be some parts illustrated not on the owner's car. The information given should not be substituted for the manufacturer's instructions for sometimes a specific grade and kind of oil is mentioned by him for use in a certain part.

Parts to Be Lubricated Daily

A1—Joints on steering drag link. Grease or graphite.
A2—Clutch collar and thrust bearing. Grease or graphite.
A3—Spring bolts. Grease or graphite.
A4—Tie rod and king bolts. Cylinder oil.

In most of the cases mentioned above cups are provided. Besides those listed the crankcase should be brought to level and the tank should be filled with oil.

Parts to Be Lubricated Every 300 Miles

B1—Steering gear case. Grease or graphite.
B2—All brake clevises or joints. Cylinder oil.
B3—Steering post Cylinder oil.
B4—Hand and foot brake shafts and pedal bearings. Cylinder oil.
B5—Commutator cleaned and given few drops of cylinder oil.
B6—Shifter lever. Cylinder oil.

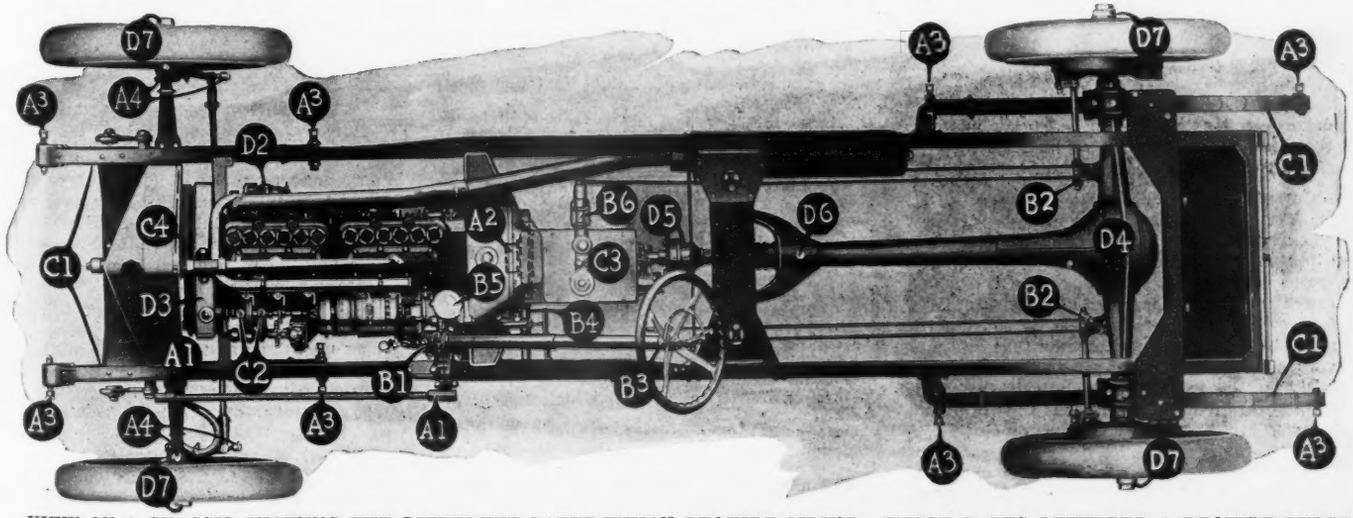
Parts to Be Lubricated at Least Every 500 Miles

C1—Spring leaves. Cylinder oil or graphite.
C2—Auxiliary motor shaft couplings. Graphite or good grease.
C4—Fan bearing lubricant. Cylinder oil.
C5—Add lubricant to gearset. Grease or gear oil.

Parts to be lubricated every 1,000 miles

D1—Drain, clean and refill crankcase. Cylinder oil or deflocculated graphite.
D2—One drop of oil on magneto distributor and oil holes provided. Cylinder oil.
D3—Motor timing gears. Cylinder oil, nonfluid oil or graphite.
D4—Drain, clean and refill all transmission gear cases. Same as above.
D5—Repack universals. Grease or graphite.
D6—Torsion tube, radius rods, etc. Grease or graphite.
D7—Clean and repack front and rear wheel bearings. Grease or graphite.

In the winter use cylinder oil for the gear compartments instead of grease or graphite.



VIEW OF A CHASSIS SHOWING THE DIFFERENT PARTS WHICH REQUIRE OILING. THOSE PARTS LETTERED A REQUIRE LUBRICATION DAILY, THOSE LETTERED B EVERY 300 MILES, THOSE MARKED C EVERY 500 AND D EVERY 1,000 MILES

From the Four Winds

A TAXI DRIVER Who Doesn't Drink—Mrs. Bessie Meagher, of Bovey, Minn., has taken a state license to drive motor cars for hire. C. G. Meagher, her husband and motor car livery owner, swore he had known the applicant 16 years and believed her to be a careful and fully competent motor car operator. Mrs. Meagher is 33 years old and in her application said she does not use intoxicating liquors.

Cars Taxed on Sliding Scale—Bay City, Mich., a city of about 50,000 inhabitants, now has 641 motor cars, according to the records of the board of assessors and they are assessed for a total of $342,825 or an average of $534 per car. Owing to the rapid depreciation in the value of cars, the assessors have established the following scale: The first year a car is assessed 60 per cent of its value, the second year 50 per cent, the third year 40 per cent, the fourth year 25 per cent, the fifth year 12½ per cent, and so on down until it is considered of hardly any value at all. The increase in the number of cars in the city over the corresponding period last year is 116, or nearly one-fifth.

New Jersey Profits from Motorists—The report for the year ending May 31 shows that the New Jersey state department of motor vehicles received $106,133.51 more in 1914 than it did in 1913 for motor car, motorcycle and drivers' licenses. In the same time there was an increase of $2,681.59 in the amount of fines collected. For the year 1913, $37,118 was collected for licenses, while in 1914 the receipts amounted to $46,057, an increase of $9,939. In drivers' licenses $41,596 was collected in 1913 and in 1914 $49,390. The total collections for 1913 were $494,202.24, while in 1914 they came to $600,335.75, an increase of $106,133.51. The fines collected in 1913 were $2,681.59, while in 1914 they were $5,445.60, the increase being $2,764.01.

New Boulevard Out of Milwaukee—A 1-mile boulevard, 90 feet wide, of sheet asphalt on a concrete foundation, is now being constructed between the city limits of Milwaukee and its big manufacturing suburb, West Allis. For many years the avenue between the two cities has had more the appearance of a morass than a highway and no remedy was found until recently, when the state highway commission discovered that it could build the road at joint state, county and township expense. The new road will connect with fine asphalt streets in West Allis and Milwaukee and form the connecting link of a beautiful drive 8 miles long from Lake Michigan to the western city limits of West Allis through the heart of Milwaukee's south side.

Car de Luxe for Cattle King—John M. Cowden, a wealthy cattleman of Midland, Tex., has the distinction of owning what is said to be the most expensive and unique motor car there is to be found in the whole ranch region of western Texas. It is a four-cylinder National and is equipped with special appliances and features that will add very much, it is claimed, to its practicability in the uses for which it is intended. In appearance it resembles the ordinary touring car, but it is so constructed that it may be easily converted into four separate sleeping compartments. It also is equipped with electric fans and lights and is so built that it can carry enough gasoline and oil for a trip of 400 miles. It is Mr. Cowden's purpose to use the car for making long journeys to different parts of the sparsely settled ranch territory, not only of Texas but of other regions of the west. Every possible comfort of travel is provided by the car.

Canadians Drag Roads for Prizes—The Saskatchewan government has adopted a novel way of improving the roads in the Canadian province. Prizes are given for the highways showing the best use of the road drag. Over $3,200 was paid out during 1913 in prize money, and the expenditure was more than justified.

Praise for Concrete Roads—That Milwaukee county's concrete roads as built during 1913 and 1914 are the best in the world, not even excepting those of Wayne county, Mich., is the opinion of the Wisconsin state highway commission after inspecting concrete work in several parts of the United States. Milwaukee county's work under the state aid highway law, which requires permanent improvement of highways, is being confined to concrete roads, and when the 1914 season is ended, the total concrete mileage will be somewhat in excess of 71. The commission states that it is constantly in receipt of requests from other sections of the country, as well as Canada, regarding Milwaukee county work, which has now reached the highest point of efficiency in construction. The average cost per mile in Milwaukee county is $12,750.

Voted for Lincoln; Aids Highway—The Lincoln highway headquarters has received an interesting letter from Cephas D. Rogers, of Meriden, Conn. Mr. Rogers in sending his check for $5.00 as a contribution to the Lincoln highway fund, states that he had the great pleasure and honor of meeting Mr. Lincoln personally during his presidency, voted for him twice for president, and heard him make his first inaugural address, at which time he was but a few feet from the president.

Safety Zones for Milwaukee—Safety zones or "isles," such as Chicago and other large cities have provided to promote safety for pedestrians, are to be established in several places in Milwaukee at once under the direction of the public safety commission. The islands will cost $140 each. Milwaukee has a large number of irregular-shaped street intersections in the busy downtown section in which pedestrian traffic is extremely difficult to handle and it is hoped by means of the islands of safety to prevent many accidents at these points.

Horses to Rest at Speedway—Carl G. Fisher, president of the Indianapolis motor speedway, has turned the infield of the speedway over to the Citizens' Humane Society and it will be used as a pasture during the summer for tired horses in need of a vacation. About two hundred horses will be taken care of at a time and each horse will be given a rest of several weeks. The horses will be selected by the humane society and Mr. Fisher has furnished funds for employing a man to look after the animals.

Motor Car Saves a Life—There is considerable agitation in Prince Edward Island over the running of a motor car between Charlottetown and Alberton over prohibited territory. Permission was given by the premier to Dr. Rose to run the machine in order to perform an operation in a very serious case. Rose took the wrong train in the morning. Had he waited for the next, he would not have reached Alberton until 11 o'clock that night. In his car he made the trip in 5 hours, almost an hour sooner than he would have had he caught the morning train. The car was marked with a red cross. Owing to the prejudice against motor cars, the drive has created considerable sensation.

Now Marking the "SS" Route—The "SS" route, connecting Superior, Wis., with St. Paul and Minneapolis, Minn., is now being laid out and marked by the Superior Automobile Club. Every fourth telephone post will be painted with a red band, containing a white circle with the letters "SS." The Superior club has recently adopted a club emblem and although only a year old is stirring up things at the Head-of-the-Lakes. It is likely that a clubhouse will be erected next year at one of the many lakes in Douglas county, of which Superior is the seat. Through the good offices of the club the Douglas county board has taken a leading rank in permanent highway construction under the state aid highway law and many Indian trails called roads are being transformed into macadam and concrete boulevards.

Coming Motor Events

SHOWS AND CONVENTIONS

September 26-October 6—Berlin show.
October 7-17—Electric vehicle show, Grand Central Palace, New York.
October 17-24—Show, Pittsburgh, Pa.
October 16-26—Paris show.
November 6-14—Olympia show.
November 14-21—British commercial car show, Islington.
November 23-28—Olympia light car show.
November 9-14—American Road Congress, Atlanta, Ga.
January 2-9—New York show.
January 23-30—Chicago show.

CONTESTS

July 17-18—Speedway races, Seattle, Wash.
August 1 and 3—Beach meet, Galveston, Texas.
August 15—Le Mans cyclecar grand prix race.
July and August—French army truck subsidiary trials.
August 2-9—Six day cyclecar reliability in French Alps.
August 16—Coupe Internationale; light car race, Le Mans.
August 17—Grand Prix of France, Le Mans.
***August 21-22—Road races, Elgin, Ill.**
September 5—Track meet, Milwaukee, Wis.
September 6-7—Italian grand prix.
September 7—Track meet, Providence, R. I.
September 9—Road race, Corona Beach, Cal.
September 14—Track meet, Milwaukee, Wis.
September 18-19—Track meet, Hutchinson, Kans.
October—Gallion hill climb, Paris.
October 2-3—Track meet, Oklahoma City, Okla.
October 2-3—Track meet, Trenton, N. J.
November 8-11—Track meet, Shreveport, La.
November 15—Kerosene motor tests, Paris, France.
November—El Paso-Phoenix road race.

*Sanctioned by A. A. A.

Among the Makers and Dealers

CECO Cyclecar Plant Opened—The Continental Engineering Co., maker of the Ceco cyclecar, is now permanently located in its plant at 1015 North Halsted street, Chicago.

Buys C. & B. Hinson Co.—E. P. and M. A. Zachman have purchased the C. B. Hinson Co., maker of fan belts, and will move the plant from Liddrell and Grove streets to 2917-19 Webster avenue, Cincinnati, O., but will operate under the old firm name.

To Direct Campaign from Detroit—Roy E. Marcotte, for the past 2 years manager of the advertising department of the Canadian branch of the Studebaker Corp., is now at the Detroit factory and will continue taking care of the Canadian publicity from there.

In Charge of Federal Truck Promotion—M. E. McKenny, formerly with the American Steel and Wire Co., the American Plow Co., Madison, Wis., and the Zender, Paeschk Frey Co., Milwaukee, Wis., is now with the Federal Motor Truck Co., Detroit, being in charge of the promotion department.

French Succeeds P. P. Willis—Lucius S. French has been appointed advertising manager of the National Motor Vehicle Co., succeeding P. P. Willis, who has resigned to become a member of the Thompson-Carroll-Tripp Co., advertising agency of Cleveland, O.

Marvel Final Dividend Paid—Referee in Bankruptcy Lee E. Joslyn is forwarding a final dividend of 5½ per cent to the creditors of the Marvel Motor Car Co., a Detroit concern which went into bankruptcy in 1907. The creditors received a 3 per cent dividend previously. All told the assets of the late company amounted to about $4,000, while the liabilities totaled about $20,000.

Macey Leaves Premier Company—One of the pioneers in the merchandising of six-cylinder motor cars, R. Ward Macey, Jr., recently severed his connection with the Premier Motor Mfg. Co., of Indianapolis, but retains his interest in the company as a stockholder. Before becoming sales manager of Premier, Mr. Macey was in the sales department of Franklin, and before that with Henry Ford.

To Start Operations This Month—The Saginaw Motor Car Co., Saginaw, Mich., which was organized to build a $395 light car, plans to begin operations this month with an initial output of ten cars. If the company's plans mature, it will build 2,000 cars in 1915 and employ 300 men. A. R. Thomas, Detroit, and David Cuthbertson are behind the project. The company has secured the Brooks motor wagon plant, 200 by 400 feet.

Tuthill Installs Hydraulic Press—The Tuthill Spring Co., Chicago, has just installed, at the expense of nearly $3,000, a hydraulic press for fastening bands upon motor car springs. The banded spring is coming more and more into favor as the band holds the plates rigidly together and eliminates the weakness caused by putting a center bolt through the plates and in addition strengthens the spring at the place where the greatest strain comes.

New Plant for V-Ray Co.—The V-Ray Co., of Marshalltown, Ia., maker of V-Ray spark plugs, has taken possession of its new plant and now is in position to turn out 3,000 plugs daily. When the company began operations in 1911 its capacity was twenty-five plugs per day. A feature of the new plant is a printing plant, used for furnishing advertising ammunition for dealers, the press having a capacity of 5,500 large sheets per hour. The company now has six branch houses in the United States and one in Canada. P. W. Sinclair, a member of the firm, is located in San Diego, Cal., from which point he looks after the coast business.

Schwarzkopf Is Made Sales Manager—E. E. Schwarzkopf has been appointed sales manager of Gray & Davis, manufacturer of starting and lighting equipments, Boston, Mass.

Appointed Pullman Sales Manager—H. W. Conrad has been appointed sales manager of the Pullman Motor Car Co., York, Pa. Mr. Conrad has been connected with the motor car industry in the west for several years.

Valve Grinder Patent Valid—The Hazeltine valve grinder patent No. 13,421, owned by the Specialty Machine Co., is valid and is infringed by the Ashcroft Mfg. Co., according to the opinion of the United States circuit court of appeals in New York. The patent is a reissue of No. 918,049 and the defendant had claimed that the lapse of time between the issue and the reissue barred the Specialty company from bringing a suit. The lower court agreed with this and dismissed the bill of complaint, but the appellate court held that since reissue narrowed instead of broadened claims, it was valid. It also found the Ashcroft device to infringe.

Recent Incorporations

Albany, N. Y.—Bradford Taxicab Co., capital stock $5,000; incorporators, B. H. Fraum, A. Gurewitz, I. Cohen.

Albany, N. Y.—Hollywood Garage Corp., capital stock $30,000; incorporators, M. Friedler, G. A. Grant, J. J. Pheland.

Alexandria, Va.—Palace Automobile Co., capital stock $2,000 to $15,000; incorporators, M. S. Fairfax, J. S. Goodrich.

Atlanta, Ga.—International Cyclecar and Accessories Co., capital stock $5,000,000.

Birmingham, Ala.—Brownell Auto Co., capital stock $10,000; incorporators, E. H. Brownell, C. W. Richardson, B. Brownell.

Brooklyn, N. Y.—Bedford Taxi Cab Co., capital stock $5,000; incorporators, I. Cohen, A. Gurewitz, B. H. Fraum.

Charlotte, N. C.—Auto Supply Co., capital stock $10,000; incorporators, D. H. Hilton, H. B. McGill, E. T. Wadsworth.

Cincinnati, O.—United States Motor Truck Co., capital stock $25,000; incorporators, R. C. Stewart, B. Bramlage, M. McLean.

Dover, Del.—International Motor Wheel Co., capital stock $1,000,000; incorporators, H. E. Tatter, W. J. Maloney, O. J. Reichard.

Jersey City, N. J.—Auto Service Co., capital stock $30,000; incorporators, G. E. Brensinger, D. H. Paterson, C. L. Munch.

Kansas City, Mo.—Standard Motor and Mfg. Co., capital stock $10,000; incorporators, H. T. Folsom, J. E. Harvey, J. B. Renshaw.

New Haven, Conn.—Self Heal Puncture Liquid Co., capital stock $2,000; incorporators, F. J. Coyle, E. J. McPartland, J. H. Hayes, J. J. Moran.

Newark, N. J.—New York Noble Air Pump Co., capital stock $100,000; incorporators, E. F. Herman, E. Herman, J. H. Herman.

New York—Imperial Auto Touring and Taxicab Co., capital stock $1,000; incorporators, A. S. Bussow, C. C. Wolf, A. Miller.

New York—Progress Auto Renting Co., capital stock $1,000; incorporators, M. Klein, S. Klein, A. P. Blum.

Oswego, N. Y.—B. Z. T. Car Co., capital stock $5,000; to deal in motors, engines, machinery; incorporators, D. N. Thompson, F. M. Baker, W. H. Zeb.

Philadelphia, Pa.—The Drown Tire and Supply Co., capital stock $100,000; to manufacture, buy, sell and deal in motor cars and accessories; incorporators, I. W. Thompson, B. S. Edwards, J. M. Frere.

Philmont, N. Y.—High Rick Motor Co., capital stock $5,000; incorporators, L. F., P. M. and F. B. Harder.

Stamford, Conn.—Enterprise Tire Shop, capital stock $25,000; incorporators, H. J. Bond, C. L. Post, R. C. King.

St. Louis, Mo.—Laclede Automobile and Supply Co., capital stock $50,000; incorporators, C. S. Clickener, L. J. Curtin, J. J. Miltenberger, H. Johnson.

Utica, N. Y.—Hale Auto Co., capital stock $500; incorporators, J. C. Hale, A. M. Hale, W. E. Hibbard, C. B. Hale, L. B. Hale.

Wilmington, Del.—The Cyclecar Co., capital stock $100,000; incorporators, E. Price, G. W. Dillman, M. M. Dugan.

Tool Company Building Addition—The Telfor Tool Co., of Buchanan, Mich., is erecting an addition to its plant costing $100,000, making the total plant worth more than $400,000. The company will manufacture motor car parts.

Form Company to Build Light Cars—A four-cylinder light car, selling at $475, will be the product of the Princess Motor Car Co., which has been organized and incorporated with a capital stock of $100,000 and which has its plant at 348 Clay avenue, Detroit. The officers of the company are C. D. Smith, president; H. W. Brenan, vice-president; I. N. White, secretary and sales manager; W. L. Smith, treasurer. There will be one standard chassis, having a wheelbase of 92 inches and 44 inch tread. The motor's dimensions will be 2¾ inches bore and 4 inches stroke.

Master Carbureter Corp. Formed—The Master Carbureter Corp., incorporated under the laws of the state of Delaware, with a capital stock of $250,000, has been organized in Detroit, for the purpose of manufacturing the Master carbureter. W. E. Burk, who is president of the Master Carbureter Co., Los Angeles, Cal., is vice-president and general manager of the Detroit corporation, while W. M. Jenkins, formerly general manager of the Pacific coast company, is general sales manager. The Detroit corporation has no connection with the Los Angeles company, but is making the same carbureter.

Packard June Truck Sales Heavy—The Packard Motor Car Co. announces that the sales of Packard trucks to users during the month of June totaled $823,394. This is exclusive of bodies. This total culminates 4 months of record-breaking truck sales, it is claimed. In March the Packard company sold more than $750,000 worth of trucks. In April the business total was 60 per cent greater than in April, 1913, while the May total was also 60 per cent greater than in the corresponding month last year. The June sales exceed those of June, 1913, by $256,994, an increase of nearly 50 per cent.

Takes Over Flanders Forge Department—For the purpose of taking over the forging department of the Flanders Mfg. Co., the Pontiac Drop Forge Co. has been formed in Pontiac, Mich., with a capitalization of $112,500. It will forge steels. The officers are M. Rothschild, Chicago, president; E. P. Waldron, vice-president; A. G. Griggs, secretary; D. C. McCord, treasurer and general manager. J. M. Grieve is production manager. It will utilize what formerly was a part of the Flanders Mfg. Co.'s plant, including the foundry building and 9½ acres of land in Pontiac, with 75,000 feet of factory floor space.

Buick Motor Has Prosperous Year—The Buick Motor Co., a subsidiary of the General Motors Co., had a prosperous year, according to reports, which state that practically all of the 1914 models have been sold, making a total of 32,000 passenger cars, which constituted the capacity of the company's plant. The company has decided to increase the output for 1915 by 8,000 machines, thereby bringing the total output up to 40,000 cars. The prices for the coming season will be materially reduced. The runabouts will be scheduled at a price $50 lower than that of last year, touring cars $100 less and the six-cylinder cars $335 less.

Brief Business Announcements

SEATTLE, WASH.—D. E. Marriott has established a tire and accessory store at 724 Pine street.

Hartford, Conn.—E. W. Keeney has taken the garage at 120 Allyn street, formerly occupied by the Brassil service station.

Minneapolis, Minn.—O. A. Jacks has been appointed retail sales manager of the La Crosse Auto Co., 921 Hennepin avenue, Minneapolis. The company handles the Marathon, Imperial and Herreshoff cars.

Boston, Mass.—Manager Sills, of the Chevrolet Co. of New England, has transferred William F. O'Brien, the head salesman at the Boston branch, to Newark, N. J., where he will be manager of the company's branch there.

Toledo, O.—The Boyd Tire and Supply Co., which does a general supply business, has started in business at Jefferson and Eleventh streets, Toledo. A. A. Atwood is president of the company, D. P. Boyd vice-president and general manager and C. H. Masters is secretary-treasurer. Both a wholesale and a retail business will be done.

Minneapolis, Minn.—R. C. Smith, formerly with the Minnesota Motor Sales Co., and A. P. Heaney, lately with the La Crosse Auto Co., both of this city, are now respectively president and general sales manager of the Regal Motor Car Co., of Minneapolis, which has been organized with a capital stock of $25,000 and will act as distributor for Regal cars in Minnesota, North Dakota, the northern half of South Dakota and western Wisconsin. The company is located at 1400 Hennepin avenue.

Seattle, Wash.—The Model repair shop has been opened at 1007 East Pike street, Seattle, and will carry a full line of Ford parts. Clarence Smith, the proprietor, is from Stevensville, Mont. He will make a specialty of repairing Fords.

Spokane, Wash.—The Holley-Mason Hardware Co., hardware jobbers, has opened a motor car supply and accessory department here under the management of J. E. Benedict, formerly of Detroit.

New York—L. A. Van Patten, Inc., metropolitan distributor of the Saxon, has been given Union, Essex, Morris, Somerset and Middlesex counties in New Jersey as additional territory. These are among the wealthiest counties of that state and subdealers will be appointed immediately.

Detroit, Mich.—F. G. W. Sudrow, formerly with the National Battery Co., Buffalo; the Stoddard-Dayton Motor Car Co., Dayton, O.; the Marion Motor Car Co., Marion, Ind., has become associated with the King Motor Car Co., Detroit, as its southern district manager.

Saginaw, Mich.—The Simons Sales Co. has been organized here with a capital stock of $30,000 for the purpose of handling the Overland cars in northeastern Michigan. The members of the firm are G. O. Simons, president; H. A. Faust, vice-president, and F. O. Van Doren, secretary-treasurer. The headquarters of the Simons company will be at 704 Genesee avenue. Besides dealing in motor cars the firm will handle supplies and accessories.

Toledo, O.—Omar Farrell, formerly of Detroit, has secured the agency for the Oldsmobile in Toledo. He has opened salesrooms at 818 Jefferson avenue, with the City Auto Exchange.

Washington, D. C.—The Hupmobile-Washington Co. has been formed to handle the Hupmobile. A salesroom and service station has been opened at 1612 Fourteenth street, N. W.

Detroit, Mich.—The Central Garage opened for business July 1, on Jefferson avenue and Shelby street, where it occupies a three-story building, 80 by 200 feet, and has space to accommodate 250 cars, thus being one of the largest garages in the state of Michigan. The officers of the company are G. E. Leveque, president; Dr. F. Newberry, vice-president; P. C. Brown, secretary-treasurer, and F. D. McCormick, general manager.

Detroit, Mich.—Arrangements have been completed between the Lozier Motor Co., Detroit, and Henry S. Houpt, Inc., New York, whereby the latter will handle the Lozier cars in the territory consisting of Philadelphia, the eastern half of Pennsylvania, Delaware, the eastern half of Maryland, and part of New Jersey, in addition to the territory Houpt already controls, namely, New York, the southern half of the state of New York, Staten Island and Long Island and the eastern half of Connecticut.

Recent Agencies Appointed by Motor Car Manufacturers

PASSENGER CARS

Town	Agent	Make
Attica, O.	Henry Fike	Detroiter
Ashland, Ky.	Wellman Motor Car Co.	Detroiter
Allendale, S. C.	J. I. Oswald	Case
Alexandria, Minn.	G. G. Wadleigh	Case
Ashley, Pa.	Harold Croll	Case
Beloit, Wis.	Hilton Garage	Case
Blaine, Wash.	A. E. Ruscoe	Case
Baldwinsville, N. Y.	L. R. Failing	Case
Baring, Mo.	Early & Hull	Case
Belle Plaine, Minn.	Fred Soehnhold & W. A. Koepp	Case
Bethany, Mo.	Dunn & Cudy	Case
Brookfield, Mo.	Barbee Garage	Moon
Cavett, O.	J. N. Borden	Detroiter
Carrolltown, O.	C. A. Hess	Saxon
Chillicothe, Mo.	Jones Auto Co.	Case
Cedar Rapids, Ia.	Moon Auto Sales Co.	Moon
Columbia, O.	E. Cherubini	Case
Chillicothe, Texas	E. M. Webb & Son	Case
Clyman, Wis.	Klatt & Berger	Case
Ekron, Ky.	Henderson & Rice	Case
E. Stroudsburg, Pa.	L. W. Myers	Case
Forrest, Ill.	G. E. Smith, T. C. Grotevant	Case
Fayetteville, O.	Charles McGuillan	Detroiter
Ft. Worth, Texas	M. F. Wortham	Case
Glenmont, O.	George L. Robinson	Detroiter
Galion, O.	E. G. Hartle	Case
Hampshire, Ill.	W. H. Bahe	Case
Hempstead, N. Y.	E. J. Christ	Case
Hudson Falls, N. Y.	J. O. Klock	Case
Hillsboro, Ore.	Wilkes Auto & Garage Co.	Case
Herington, Kans.	Herington Motor Co.	Case
Jamestown, O.	W. F. Harper	Detroiter
Kimball, Minn.	J. P. Guptill	Case
Lake Crystal, Minn.	W. R. Roberts	Case
Larchmont, N. Y.	C. O. Hamilton	Case
Logan, O.	Hocking Valley Auto Co.	Detroiter
Lancaster, O.	C. E. Cline	Detroiter
Lexington, Ky.	Phoenix Motor Car Co.	Howard
Millbrook, Ill.	Glen Van Tasell	Case
Monessen, Pa.	Monessen Plumbing Co.	Moon
Moab, Utah	Moab Thompson Trans. Co.	Case
Mead, Colo.	Jesse E. Kitts	Case
Manhattan, Kans.	F. C. Richards	Case
Marietta, O.	F. G. Henry	Detroiter
Marion, O.	A. D. Hill	Detroiter
Norwalk, O.	Big Garage	Chevrolet
New Straitsville, O.	David Watkins	Detroiter
Newark, O.	Sigler & Norris	Detroiter
New Glarus, Wis.	N. K. Zweifel	Case
Nicollet, Minn.	Johannes Bros.	Case
Ortonville, Minn.	Chester Olson	Case
Okanoogan, Wash.	Frank Bartell & Co.	Case
Piqua, O.	C. R. Alexander	Detroiter
Providence, R. I.	R. W. Powers	Hudson
Riverside, Cal.	A. N. Barber	Maxwell
Roanoke, Va.	Harding Twyman	Case
St. Paul, Minn.	Eugene Osborn	Case
Starkville, Miss.	W. O. Page	Case
Shuqualak, Miss.	J. J. Prince	Case
Shannon, Ill.	Harry Cheeseman	Case
Syracuse, N. Y.	G. W. Bennett	Case
Tallula, Ill.	Tallula Auto Co.	Case
Virilia, Miss.	A. P. Cameron	Case
Winnebago, Minn.	R. G. Slater	Case
Waconia, Minn.	Max Weinmann	Case
Wilson, Wis.	W. C. Roseberry	Case
West Manchester, O.	H. A. Geeting	Detroiter
Washington C. H., O.	The Economy Sales Co.	Detroiter
Wooster, O.	Wooster Garage	Detroiter
Wheeling W. Va.	Union Auto Co.	Detroiter

COMMERCIAL CARS

Clinton, N. J.	Frederick Neuhaus	Koehler
Galveston, Tex.	John Christensen & Co.	Koehler
Meridian, Miss.	Federal Truck Co.	Commerce
St. Louis, Mo.	E. S. Curtice	Koehler
Summit, N. J.	E. F. Anderson	Koehler
Worcester, Mass.	Whalen Brothers	Koehler

HOLLEY CARBURETOR

We are now prepared to furnish the new self-adjusting Holley carburetor in a size and shape suitable

For Use on Cyclecars

This model, which is made exactly like the regular NO-MOVING-PARTS HOLLEY now in use on over 500,000 motor cars, will be found to give excellent results on all kinds of small motors.

It greatly simplifies the design and does away with the complications which attend the use of the old-fashioned spring valve carburetor.

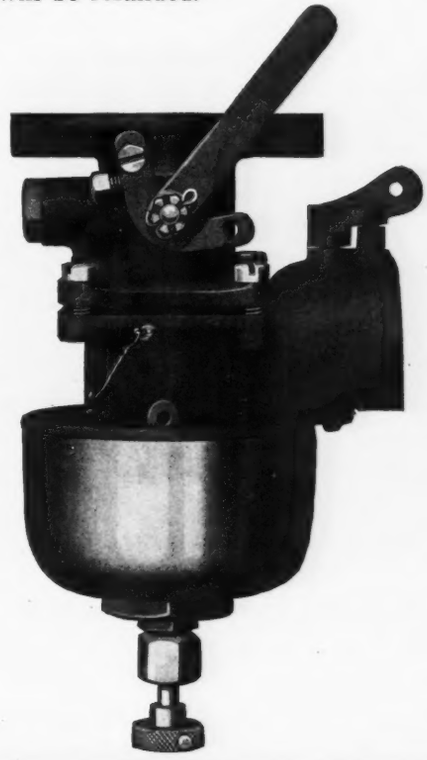
It has only one adjustment, the gasoline valve, so that after it is once set at the factory it needs no further attention.

It automatically compensates for all changes of pressure and weather conditions.

IT COSTS A LITTLE MORE THAN OTHER CARBURETORS, BUT IT'S WORTH IT.

Sold on the guarantee that if it will not give more power, work with greater economy, perform better than any other carburetor on the market, it may be returned at any time within 30 days after date of sale, and money will be refunded.

Write for dimension sheet and catalog.



Holley Brothers Co.
Detroit, Michigan

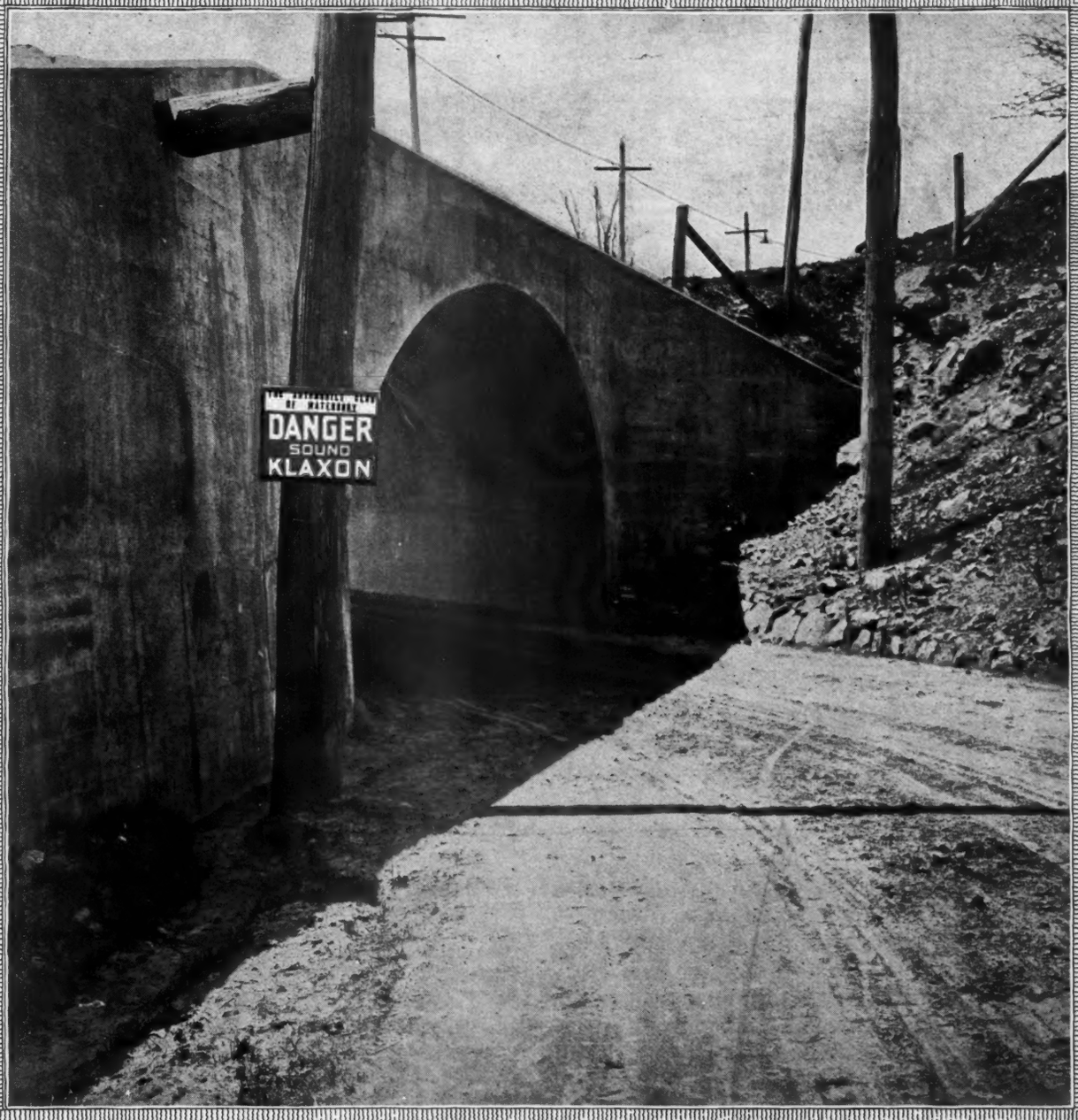
DEALERS AND BRANCHES

REO ACCESSORIES CO.,
1220 Michigan Ave., Chicago, Ill.
OMAHA RUBBER CO.....Omaha, Neb.
H. F. BROWNELL CO.....Sioux Falls, S. D.
Foreign Branch: HOLLEY BROS. CO.,
Coventry, England
HUGHSON & MERTON,
530 Golden Gate Ave., San Francisco, Cal.

BRANCHES:
Los Angeles, Cal., Hughson & Merton, 1229 S. Olive St.
Portland, Ore., Hughson & Merton, 329 Ankeny St.
Seattle, Wash., Hughson & Merton, 924 E. Pike St.

It does not take either space or words to sell an article of merit to a man of brains.

WHEELER & SCHEBLER
INDIANAPOLIS



STATE LAWS require that motor cars carry "suitable" or "adequate" signals. ¶ Can you imagine a "honk" or a "buzzer" horn *suitable* or *adequate*—as required by law—in a Klaxon situation like this?

SAXON $395

From Coast to Coast

ON July 4 the Saxon car finally demonstrated its independence of all road conditions. For on that famous day a Saxon reached San Francisco, having traveled 3389 miles overland from New York in 30 days across the Lincoln Highway—the first automobile to make a continuous trip from New York to San Francisco over the Highway and the first car of its size and price to make the journey from coast to coast.

Over the Alleghanies, over the Rockies, over the Sierras went the Saxon without faltering. Through mud, through sand, over the great plains, across the great American Desert, the Saxon held to its schedule and averaged 30 miles to the gallon of gasoline all the way.

8,000 Miles in 60 Days

It went from New York to Canton, Ohio, across the long grades of Alleghanies through the hottest weather of the year, without needing a drop of fresh water in the radiator. Folks used to say "Cool as a cucumber," now they say "Cool as a Saxon."

The same car from April 8 to May 8 ran 135 miles a day for 30 consecutive days—4050 miles—averaging 30 miles to the gallon of gasoline and 150 miles per quart of oil, covering the entire distance on the original set of tires. In 60 days this transcontinental car has covered almost 8000 miles—as far as the average owner drives in two years.

On May 16, 100 regular stock Saxon cars in as many towns all over the country made non-stop runs of 200 miles each, averaging 34.53 miles per gallon of gasoline—less than half a cent a mile for fuel, less than ¼ cent a mile per passenger.

Making Good Everywhere

On May 28 and 29 two Saxon cars were driven from Detroit to the Indianapolis Speedway races in a cross country tour of the Wolverine Automobile Club with cars of all sizes and prices. The Saxon kept up with the other cars, arriving on time, averaging 25 miles an hour for the entire distance, making 31.3 miles to the gallon of gasoline and taking no car's dust.

Everywhere and under all road and weather conditions the Saxon makes good. Five thousand Saxon cars have been delivered and orders come faster all the time. This can mean only one thing—that the Saxon has found its market because the Saxon car is pleasing those who use it.

No other car in the world offers you Saxon features of high grade construction at a price anywhere near the Saxon price of $395. Order now. There won't be nearly enough Saxons to go around this year.

DEALERS: Write today and learn if your territory is still open. Just ask for Saxon catalog.

The 3389-mile coast-to-coast run has again demonstrated to the nation the economy and durability of the sturdy $395 Saxon

Saxon Motor Company, Detroit

Address Dept. M

When Writing to Advertisers, Please Mention Motor Age.

The LBA Battery

Never Copies— It Leads the Procession by a Large Margin

Its outside appearance has been closely copied by other makers, but the inside, the part that counts, has never been duplicated.

To offset the LBA reputation for great superiority,

Some Claim Greater Capacity
" " Lower Price
" " Heavier Construction
" " Lighter "
" " Thicker Plates
" " Thinner "

—BUT—

they all use as a basis for comparison the old reliable LBA, which maintains, as it always has, a symmetrical, well balanced compromise between weight, capacity and price.

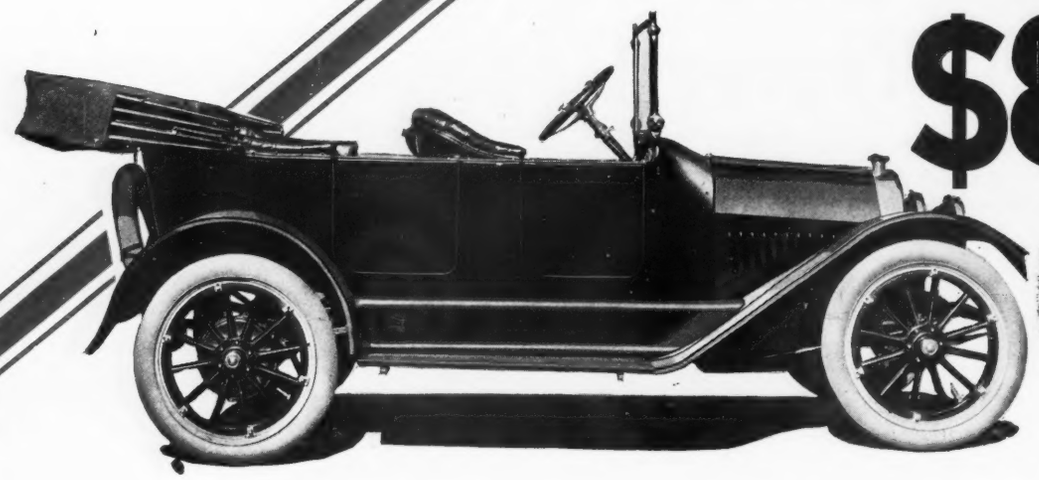
Over 300,000 LBA Storage Batteries have been put into service during the year ending July 1st, by 141 makers of gasoline cars. (See our published index of manufacturers who use LBA exclusively.)

LBA Willard Storage Battery Co., Cleveland, Ohio LBA

New York Branch: 228-230 W. 58th St. **Detroit Branch: 736-740 Woodward Ave.**
Chicago Branch: 2241 Michigan Ave. **San Francisco Branch: 821 Monadnock Bldg.**
Indianapolis Branch: 318 North Illinois Ave.

SERVICE STATIONS IN ALL PRINCIPAL CITIES IN THE UNITED STATES, CANADA AND MEXICO (106)

THE NEW WAHL



$890

(Completely Equipped)

Electric Starter, Dynamo and Generator $125 extra

F. O. B. Detroit, Mich.

1915 Cars Are Now Ready for Delivery

The new Wahl car for 1915 is now ready for delivery. Our engineers have worked for nearly twelve months in perfecting this new model, and in offering it to the public we are positive that no greater value exists today in the popular price class cars. The many new features include the One Lady Top, now universally adopted by the highest priced cars; full stream line body with flush sides and full vestibule; large side doors with concealed hinges; luxurious wide seats with deep, comfortable cushions, that permit ample room in tonneau for three people; large electric headlights which contain a large and small bulb; powerful electric horn, and a proven standard electric starter. Look over the complete specifications and compare them with any other car, and you will realize the completeness of every detail of the car itself, as well as its equipment.

In the manufacture of the Wahl car we determined to build a car FOR ALL THE PEOPLE—a motor car made and sold at a price within the buying power of the greatest number of possible owners. Each car we build receives the personal attention of our best engineers. The Wahl car is right and its price is right. Our factory co-operates with its dealers under a liberal and progressive policy, in the distribution of its cars. We stand behind every car because no car is shipped till we know that it is perfect in every detail.

Increased Production for 1915 Opens Territory to 25 Additional Dealers

The confidence and enthusiasm shown by our present dealers and owners was of such positive assurance that the Wahl car is today the greatest value on the market in its price class, that we have enlarged our factory facilities. Our production for 1915 will be materially increased. Consequently we want more dealers.

SPECIFICATIONS

MOTOR. Four cylinders. Thermo-syphon type. 3¾ inch bore, 4½ inch stroke. Cylinders cast in pairs. Silent, efficient and flexible. Crank shaft of drop forged, high carbon steel. Valves fully enclosed.

UNIT POWER PLANT. The Motor, Clutch and Transmission are built and assembled in one unit.

CLUTCH. Nine-inch disc-type Clutch with Raybestos lined discs. Quick, easy engagement without "grabbing."

TRANSMISSION. Sliding, selective type, four speeds—three forward and one reverse—quiet, smooth running; equipped with annular bearings. Transmission and Clutch readily accessible and adjustable.

IGNITION. Atwater Kent. The simplest and most efficient ignition at all speeds for the novice as well as the expert.

STEERING. Irreversible, with 17 inch steering wheel.

REAR AXLE. Standard, semi-floating, with Hyatt roller bearings. Bevel drive and pinion of extra large size and strength with specially designed housing of great strength, yet light weight.

FRONT AXLE. I beam section drop-forging, dropped forged steering arms and knuckles, with large drop forged spindle.

BODY. Full stream line, flush sides, full vestibule, side doors with concealed hinges, ample room in tonneau for three people, luxurious wide seats, with deep, comfortable cushions.

TOP. Special design, one-lady top, universally adopted by all higher priced cars. Permits egress and ingress easily.

GASOLINE TANK. 14 gallons capacity.

CONTROL. Center control. Cane lever gear shift, with short travel in center, with emergency brake lever adjacent, right hand steer. Clutch Pedal left, Service Brake Pedal right. Foot accelerator between them. Throttle and spark lever above steering column.

COLOR. Wahl blue-black. Nickel trimmings.

COOLING SYSTEM. Thermo-syphon system. Large Mercedes radiator, V type, with excess circulation in conjunction with belt-driven fan.

LUBRICATION. Constant level and force feed by pump located on the motor, furnishing continuous spray to all moving parts of the motor.

BRAKES. Two external contracting, two internal expanding, acting on 12 inch drums on rear wheels. Service brake operated by foot pedals. Quick acting emergency brake lever at side of gear shift lever.

RUNNING GEAR AND WHEELS. 112 inch wheel base. "Artillery" type wheels, 32 inches, with heavy second growth hickory spokes. Demountable rims—one extra rim. Tires, 32x3½ inches, front and rear. Firestone and Ajax.

SPRINGS. Front, semi-elliptic; rear, three-quarter elliptic.

FRAME. Pressed Steel, channel section, dropped, giving low center of gravity and easy riding qualities.

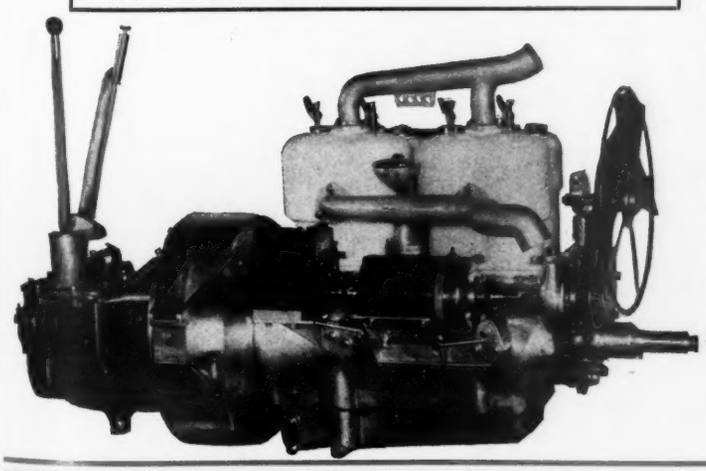
EQUIPMENT. All Wahl cars completely equipped, including the following: Mohair Top, Top Boot with special enclosing curtains, Windshield, Speedometer, full Electric Lights—large headlights with large and small bulbs, Electric Horn, Tire Repair outfit, Tool Kit, Pump, Jack and Tire Holder on rear.

PRICE. $890.00, Completely Equipped. With electric starter, dynamo and generator, $125.00 extra. F. O. B. Detroit.

WEIGHT. 2250 lbs.

MECHANICAL EXCELLENCE

The Wahl motor, with its complete unit power plant, was specially designed by the Hazard Motor Mfg. Company, Rochester, N. Y. Its extreme simplicity of construction is one of its notable features. Yet it is strong and dependable in operation. The light weight of the car itself is only 60 lbs. to every unit of horsepower developed by the motor, which insures maximum work at minimum cost.



Power—Silence—Comfort—Safety

To Dealers and Prospective Owners

In the adjustment of automobile values there are four paramount features which every motor car should have: Power—Silence—Comfort—Safety.

The Wahl has each and all of these features. A specially designed motor gives sufficient power to meet every existing road condition. It is silent—flexible and positive in action. It is designed for all manner of people—the experienced motorist—skilled automobile man—and the novice. The car itself is roomy, comfortable, luxurious in appointments. Its long wheel base gives ease of riding; its big, easy-riding springs, front and rear, are a guarantee of comfort whether with a single passenger or a full load. The One Lady Top with its adjustable inside curtains is a guarantee against annoyance with changeable weather conditions.

The mechanical assembly and final testing of each Wahl car is the best that is known to the engineering profession. This is positive assurance of safety to yourself and family at all times.

Furthermore, the Wahl car is built for service—long service—and it is given in full measure.

We want twenty-five additional dealers—dealers where we do not have representation at the present time. We are specially desirous of establishing dealers in those sections which have not had an opportunity of seeing the Wahl car in actual service. A demonstration is a sure sale. Our policy is a liberal one. Write today—use coupon or telegraph—tomorrow may be too late.

The Wahl Motor Co.
Dept. 18, Detroit, Mich.

COUPON

Please send me your Dealer's Proposition.

(Name).....

(Address).....

(Territory desired).....

When Writing to Advertisers, Please Mention Motor Age.

Introducing
America's Greatest "Light Six"
$1485

HAYNES
America's First Car

SINCE Elwood Haynes built America's First Car twenty-two years ago, the public has looked

SINCE Elwood Haynes built America's First Car twenty-two years ago, the public has looked to him to set the standard in motor car values.

The Haynes latest production is this beautiful, powerful "Light Six," with graceful streamline body, 55 brake horsepower en bloc motor having a flexibility that enables you to throttle down to two miles per hour and sufficiently powerful to make a mile a minute.

Unit power plant, 3-point suspension.

121-inch wheelbase, left hand drive, center control, with instruments located conveniently on cowlboard, within easy reach of driver.

Weight completely equipped 2950 lbs., giving a horsepower to every 55 lbs. of weight.

Leece-Neville starting and lighting separate unit system; ignition from storage battery through Remy distributor and transformer coil.

Economical Rayfield carburetor with intake manifold cast integral, insuring perfect carburetion from low test gasoline and giving a mileage as high as 25 miles to the gallon.

Gasoline supplied by the Vacuum System, eliminating hand and mechanical air pump, pressure gauge and other complications. Gas tank located at rear of chassis, where easily filled.

Splash and force feed lubrication, water circulated by centrifugal pump, cooling being further aided by large pressed steel fan, and spacious cellular radiator.

Clutch of the positive three-plate dry disc type lined with Raybestos, smooth and effective, easy to operate.

Transmission of selective sliding gear type, three speeds forward, one reverse.

Haynes full floating rear axle.

Exclusive arch frame construction over the rear axle and 54-inch semi-elliptic oil tempered springs giving easy riding qualities not to be obtained with other constructions.

Low center of gravity, long sweeping body lines.

Second-growth hickory wheels and 34x4" tires. Firestone demountable rims, spare rim included.

Motor driven tire pump, Stewart-Warner speedometer, Improved one-man top, Collins quick adjusting curtains, clear and rain vision ventilating windshield, tire carrier at rear of chassis, clear running-boards, electric horn under hood.

These and other exclusive Haynes features insure the popularity of America's Greatest "Light Six." This car is designed by the Haynes engineers and is built at the Haynes factory, with the same scrupulous care that has always characterized the Haynes product. Its simplicity of design provides increased power, endurance and general reliability.

A Complete Line of Complete Cars

MODEL 30—America's Greatest "Light Six" $1,485

MODEL 31—"Big Six," 65 brake horsepower 2,250
130-inch wheelbase

MODEL 32—Haynes "Four," 48 brake horsepower 1,660
118-inch wheelbase

Catalog mailed upon request. Coupon herewith for your convenience. WRITE

Fill In and Mail Today

THE HAYNES
AUTOMOBILE COMPANY,
2 South Main Street,
Kokomo, Ind.

Please send me 1915 catalog with full particulars in regard to America's Greatest "Light Six."

Name .....

Address .....

I expect to buy a car about .....

The Haynes Automobile Co.

2 South Main Street

KOKOMO, INDIANA

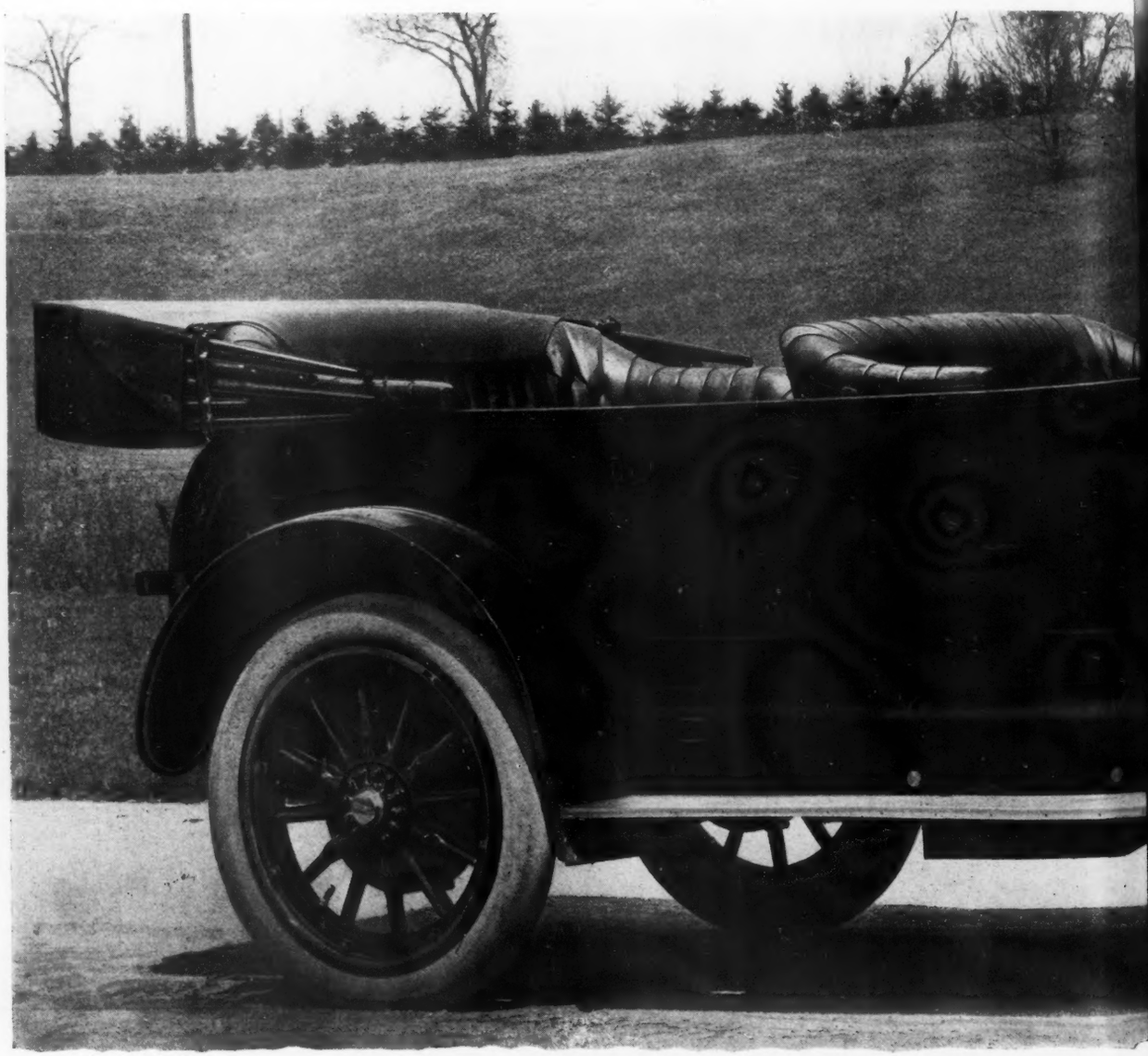
When Writing to Advertisers, Please Mention Motor Age.

1915 A New Series--A

MR. DEALER:

Have you ever seen a better looking car? No! IT'S A REAL 1915 MODEL and it lists at $400 less than its predecessor. AND the same quality of specifications remain (and there are no better in any car irrespective of price).

Here is the great big buy of the season. THINK IT OVER. Then act! Attractive appearance and price; sturdy construction and UP-TO-



Premier Motor Manufacturing Co

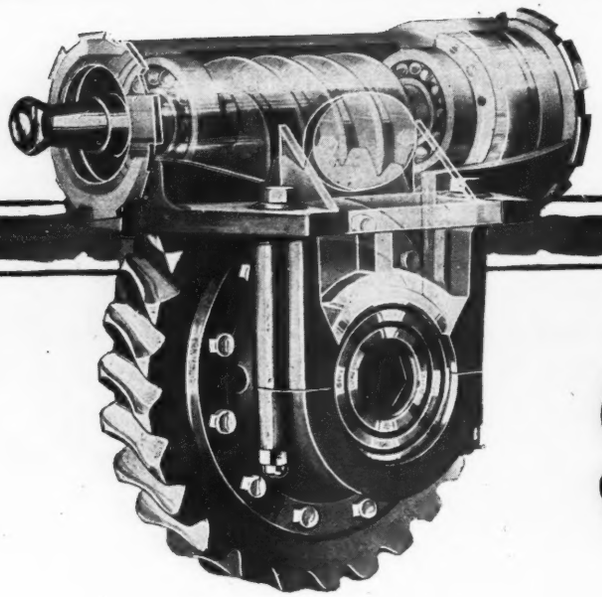
s—A New Price $1285

THE-MINUTE design and equipment, backed by PREMIER reputation and prestige, insures the sales advantage—the edge—to do the big early 1915 business with this Premier 6-49.

Let us hear from you or call and see this car and the factory that builds it.

PROMPT DELIVERIES—IMMEDIATE PROFITS

ng Company, Indianapolis

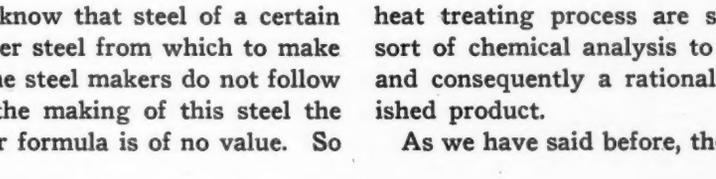


SHELD

The fact that in our half century of experience and research we have learned how best to make Sheldon Springs and what to use in their making is really only an incident in the supremacy and dominancy of those Sheldon springs. The real important fact is that by the most exhaustive analyses, tests and checkings we insist always upon knowing that this best material is always used and that these best methods of handling that material are common practice throughout our entire organization.

SPRINGS

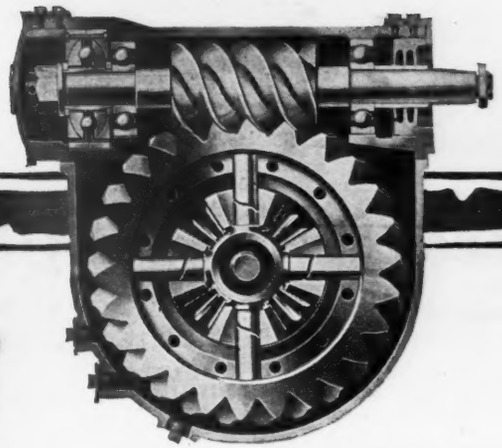
It is well enough to know that steel of a certain specification is the proper steel from which to make certain springs, but if the steel makers do not follow these specifications in the making of this steel the knowledge of the proper formula is of no value. So that it has always been a never-failing practice in the Sheldon factory to test and check up all materials and every operation in the most exhaustive manner to make sure that the finished product will live up to its fullest possibilities of performance. For that reason, every single shipment of steel is most carefully analyzed and if it does not conform in minutest degree exactly to our formula, that raw stock is never made into Sheldon springs. And even the baths that are used for quenching during the heat treating process are subjected to the closest sort of chemical analysis to insure their uniformity and consequently a rational consistency in the finished product.



As we have said before, the finished spring in spite of all these preliminary precautions is thoroughly subjected to extreme tests for hardness, toughness, brittleness, bending, tension, twisting, shock and endurance. Of all these tests the most important is the final test of vitality or as it is called the "endurance test." An ordinary spring would require at least many months to determine if it possesses any exceptional endurance and it may take several years perhaps to break it. But in the Sheldon "life tests" which are made on machines

SHELDON AXLE CO.

Makers of Springs and Axles for Heavy Duty Service for more than 50 years



LDON

especially designed for this very purpose the lesson of years is learned in as many days or even in as many hours.

So important is this test in particular and all the other Sheldon tests in general that in subsequent copy we will go into these separately, dwelling at length upon the details followed in each and every one of these tests, so that even the layman may realize fully just how important a part they play in the acknowledged supremacy of the finished Sheldon product.

WORM GEAR AXLES

In order to emphasize even more fully than we have in the past the practical reasons for our unlimited enthusiasm and confidence in the correctness of Sheldon worm gear design and construction—especially its relation to the use of double thrust ball bearings in the handling of the heavy thrust load of the worm shaft in operation—we wish to cite here a few specific facts that have been proved in practice.

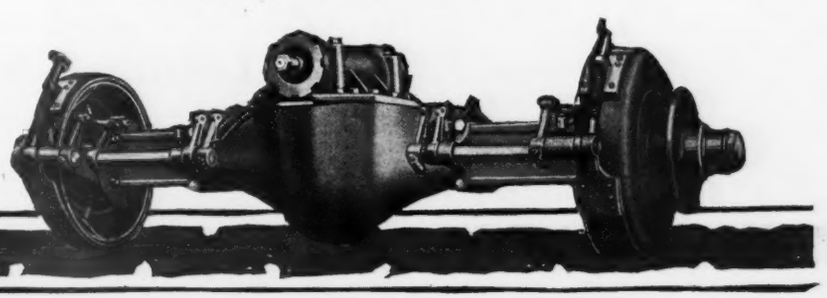
By means of a series of varied tests we have been able to demonstrate the fact that in the Sheldon type of worm gear rear axle we are getting power efficiency at the rear wheels varying from 94 per cent to 97 per cent of load applied. This remarkable efficiency combined with the fact that the London omnibuses using practically the same type of construction are operating something like 3,000 buses on the streets of London with the absolute minimum of repair and upkeep that they have ever experienced brings to your notice two concrete facts that certainly must go a long way towards the substantiation of our claim of superiority.

When you can operate a truck with a showing of from 94 per cent to 97 per cent efficiency in relation to load applied—when that truck shows the minimum of upkeep and repair and when you are almost certain to get from 60,000 to 80,000 miles of service out of the working parts of the axle, then surely it is safe to say that axle designing and construction has almost reached the idealistic stage of perfection.

And all of this high efficiency present with practically a noiseless operation. In Sheldon axle construction it is utterly impossible to hear anything but the slight hum of the ball bearings and even this noise is practically drowned with the bath of oil in which the ball bearings are immersed. In fact, the tendency towards noise in worm gear construction is the direct opposite to that of any other type of gear construction. For in worm gears the longer they are used right up to the very end of their life the less is the possibility of noise, while in other gear construction the amount of wear and tear is usually measured by the noise made by the gears themselves.

Wilkesbarre, Pa.

Chicago 122 S. Michigan Blvd. **San Francisco** 444 Market St. **Detroit** 1215 Woodward Ave.



Written for Men Who DO BIG THINGS

Let us get your mind concentrated on this thought.

The automobile that is going to live will be the automobile that leads—

The big, broad gauged American who is a leader in his own business always looks for leadership in other lines and accords it profound recognition when he finds it.

This principle is worth noting, because it has a direct and powerful application to the automobile we are building.

The leaders in finance, in sports, in art, in industrial activities, in commerce and finance, are well known to all of us.

Their leadership is an established fact and is based on extraordinary accomplishment.

When we of the automobile business look about us for real leadership we find that a small group dominates. One part of the group dominates by quantity. The other dominates by quality.

The Moline-Knight 4 cylinder automobile is in the quality dominating group. In one particular—it leads the others.

The particular position that the Moline-Knight has won is due to a demonstration of power, service and strength that has never been equalled in automobile history.

Every well posted automobile engineer knows what the Moline-Knight has done. It is important that men who sell cars and men who drive them shall also know it—because in the new era that is dawning in the automobile business, MEN WHO DO BIG THINGS will not be satisfied to own or drive just ordinary cars. And the big men who SELL CARS will also recognize leadership, because they will not be satisfied to successfully merchandise just ordinary cars.

The Moline-Knight is an extraordinary automobile.

MOLINE AUTOMOBILE COMPANY
EAST MOLINE, ILL.

The Story of a Car That Stood Up

When this corporation accepted the Knight principle for the Moline car, we were satisfied that it represented the greatest mechanical advance that had been made in motor building of the internal combustion type.

Remember, we were engine builders long before automobiles were thought of.

We wanted a demonstration of the efficiency of the combination, The Knight principle and Moline engineering.

Arrangements were made with the mechanical research division of The Automobile Club of America for the most thorough and carefully measured test of an automobile engine that had ever been made by an absolutely nonpartisan group of qualified engineers.

Result: To quote from the report of the testing committee, "Moline-Knight Motor ran without any stop whatever for three hundred and thirty-seven hours with wide open throttle and set spark, at an average speed of 1117 revolutions per minute, with an average brake horsepower of 38.3, ending up with 53 horsepower at 1682 revolutions a minute.

The equivalent of two weeks continuous operation and measured by the mileage produced 14700 miles at 45 miles per hour.

When this test was ended, the Moline-Knight automobile had established, without question or doubt, its position of leadership of American made automobiles.

We believe we have reason, and good reason, for the particular attention of the motorist and the dealer, who wants the prestige that comes from owning or selling a car of unique and established character. We will not particularize here on details and refinement of finish, and construction. We will say, and prove, that every part of the car is as sound and as beautiful, and as replete with character as the great engine which made it famous.

The Moline-Knight has extraordinary attractions for the man who wants a different and better automobile.

There is a limited product. Four to five cars a day are as many as we can build —OUR WAY.

Our way is the careful, scientific way, with every step in design, construction and manufacture watched by experts. Men who put their hearts in their work, and who are proud of their product. We want the dealers who have customers for this kind of a car to write to us. We want the men who will buy this kind of a car, to ask for further information.

MOLINE AUTOMOBILE COMPANY
EAST MOLINE, ILL.

Hot Weather Driving

—It simply takes the "starch" out of ordinary inner tubes. Don't trust to "luck" in selecting tubes and expect to get by without frequent punctures, pumpings and buyings.

Right now, of all times, your tires need the support of

Firestone

Red Tubes

You need the extra quality and quantity of rubber in Firestone Tubes.

You need the extra strength and heat resistance and "come back" of the Firestone special antimony cure.

You need the Firestone special building—layer by layer—greatest density of texture with maximum elasticity.

You need the lasting vitality that Firestone material and building insure. A Firestone Tube does not deteriorate on dealer's shelf or in your reserve kit.

So don't trust to luck when you can trust to Firestone—ride in care-free confidence and with the sure economy of—

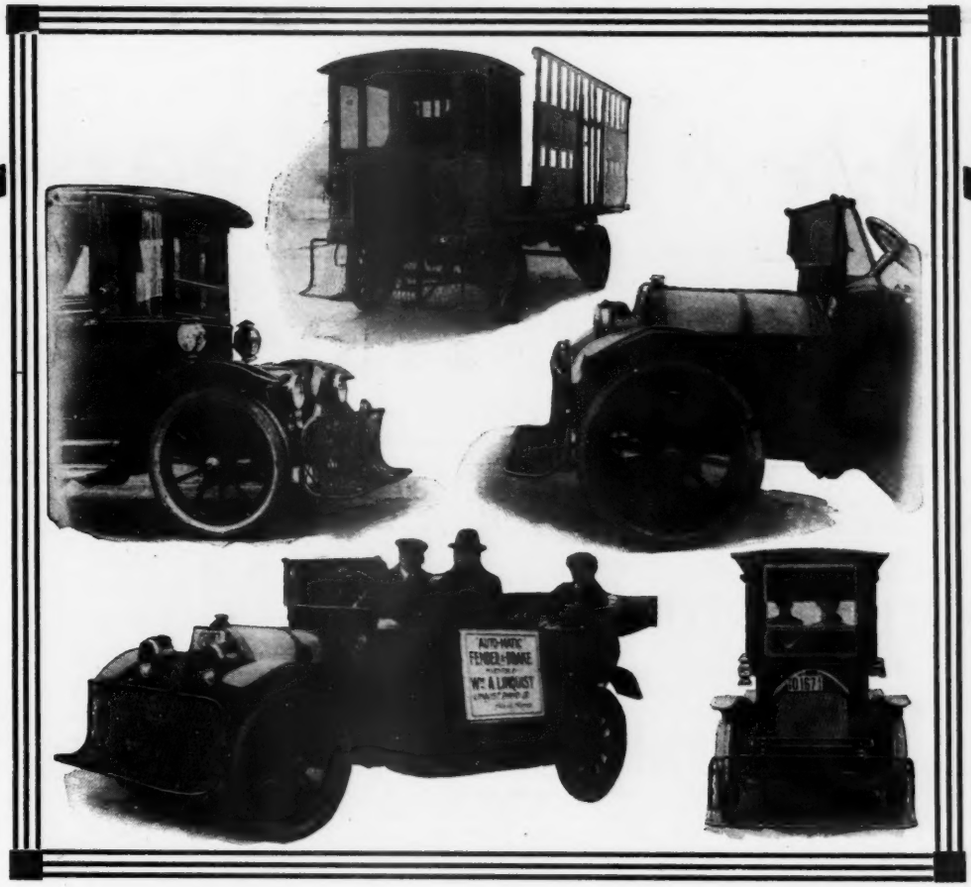
Most Miles per Dollar

Sold by Leading Dealers Everywhere.

Firestone Tire & Rubber Co., Akron, Ohio—Branches & Dealers Everywhere

"America's Largest Exclusive Tire and Rim Makers"

Pneumatic Tires, Truck Tires, Pleasure Electric Tires, Carriage Tires, Cycle Tires, Fire Apparatus Tires, Rims, Tire Accessories, etc.



Adapted to Touring Cars Trucks Electrics

Best Insurance Obtainable Against Accidents

It Automatically Drops the Fender—Puts on the Brakes—Stops the Motor

The only **Automatic** Fender and Brake in the world. Relieves the motorist of all anxiety in an emergency. The entire device acts **automatically** the moment it comes in contact with any object. No matter how flustered the motorist may become, the LINQUIST Fender and Brake is **always on the job**—protecting pedestrians, you, your car and its passengers, other cars and their passengers.

Linquist Automatic Fender and Brake

Endorsed by Safety First Societies throughout the country as the best protection ever afforded motorists and foot passengers. Pays for itself in the accidents and subsequent damage suits it averts.

Personal injury damage suits for amounts ranging from $100 to $15,000 have been instituted against motorists who might have avoided the courts had they simply safeguarded themselves with a LINQUIST Fender and Brake. Authorities agree that this device should be the means of saving the thousands of lives needlessly sacrificed every year.

A necessity to naturally timid drivers, to beginners, and to lady motorists. **It lends confidence.**

Works absolutely **automatically.** No foot or hand levers with which to bother. The Fender can be lowered, brakes applied and engine stopped **before** striking an object, if desired.

The LINQUIST Fender can be lowered or raised to any desired position. An excellent bumper—strong, light in weight, neat in appearance.

Extends 15 inches forward same as regular bumper bar. All parts interchangeable and adjustable to fit any make of car.

DEALERS, MANUFACTURERS, AGENTS: Here's the most revolutionary Safety First device on the market. Every motorist who values the safety of his car, his own safety and the safety of others is a **live** prospect.

The profits are big, because the sales possibilities of this device are unlimited. Get exclusive territory rights **today.** Write or wire us.

The inventor will also consider partnership arrangements for manufacturing and selling in stated territories, also royalty propositions.

Write for Price List and Full Descriptive Literature

Wm. A. Linquist, Inventor, 901-903 MARQUETTE AVENUE **MINNEAPOLIS, MINNESOTA**

Have You Read The S
"The Ideal Car" of

Last week the Society of Automobile Engineers met at Cape May.

The principal topic of discussion was the ideal car.

The most brilliant engineering minds of America were concentrated in the formulation of a set of specifications, which, all taken together, would constitute the ideal car for you.

Note the principal ones on the opposite page and then watch out for the announcement of this Company in the July 25th issue of The Saturday Evening Post and in the columns of the motor journals.

Suggested Specifications of the S. A. E.?

Specifications as commonly advanced by engineers

- Full French Stream-line Body
- Worm Drive
- 4-Speed Transmission
- Cantilever Springs.
- 2-unit, 6-volt Electric Starter
- Three-plate Dry Disc Clutch
- One-Man Top
- Daimler Leather Couplings
- Pump Water Cooling System
- High-Speed, High-Efficiency 6-Cylinder Motor
- Size of Motor: About 3x5
- High Tension Ignition
- Left Side Drive, Center Control
- Two Brakes: Internal Expanding
- Rear Axle: Full floating
- Weight: About 2750

The Thomas B. Jeffery Company is fast being recognized as the pacemaker in American motor car engineering practice. The now famous Jeffery Four exemplified this.

This last recognition of Jeffery leadership by America's supreme court of engineering is a fitting triumph.

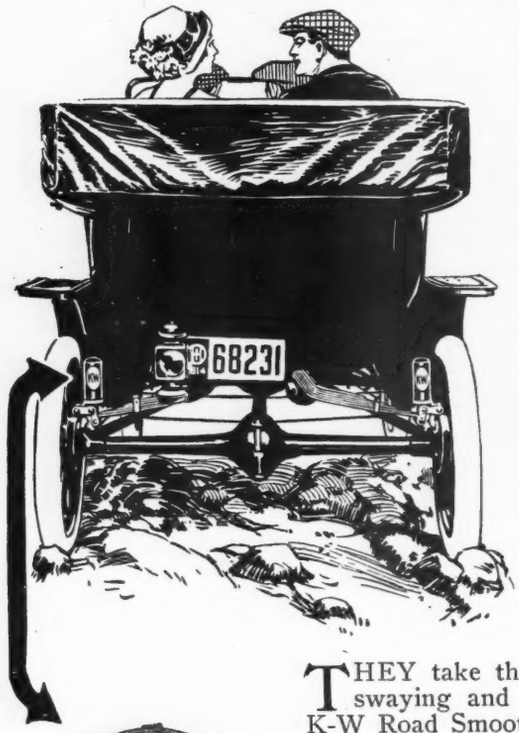
The Thomas B. Jeffery Company
Main Office and Works, Kenosha, Wisconsin

HIGH and LOW TENSION MAGNETOS

TRADE K-W MARK

MASTER VIBRATORS
ROAD SMOOTHERS
AUTO LOCKS

Make Every Road a Lincoln Highway



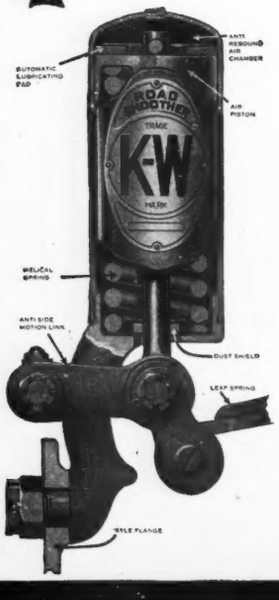
Don't wait for good roads. Make them. Get big, heavy car comfort from your light, economical Ford by Smoothing out the Rough Roads with

TRADE K-W MARK

ROAD SMOOTHERS

Reg. U. S. Pat. Off.

Quickly Applied to your Ford Car



THEY take the roughness out of the road and eliminate the pitching, swaying and vibration that racks and shortens the life of your car. K-W Road Smoothers seem to level off the high places and fill up the low places. Wherever you ride the bumps and jolts are gone—**ironed out** by the K-W Road Smoothers. They save tire and gasoline bills and add greatly to your safety and the life of your car.

The "anti-rebound air chamber" prevents the rebound of the spring. It is an essential feature and found ONLY in the K-W Road Smoothers.

The "anti-side-motion links" of the K-W Road Smoothers prevent side rocking and swaying when turning corners, and greatly reduce any tendency to skid.

There are no wearing parts or friction surfaces, consequently no oiling or packing in grease is necessary. No attention required after installation.

K-W Quality Throughout

K-W Road Smoothers are built of the very best materials obtainable. We use no cheap castings but instead, high-grade, heat-treated drop forgings. Our springs are made of electric smelted chrome, Vanadium steel—the most expensive spring steel that money will buy. They will not bend—they will not break—they will not lose their easy riding qualities because K-W quality is built into them all the way through. Phosphor bronze bushings are used throughout.

$25 SET OF FOUR ONE FOR EACH WHEEL

The principle is right—the design is right—the workmanship is right—and the price is right.

K-W Road Smoothers are sold by reliable dealers everywhere. If your dealer cannot supply you, we will send a set direct to you on receipt of price. Don't confuse these with ordinary shock absorbers. Write for free booklet—"Taking out the Bumps." We will gladly send it on request.

HEADLIGHTING OUTFITS

THE TRADE K-W MARK IGNITION Co
2835 CHESTER AVE CLEVELAND, OHIO, U.S.A.

SPARK COILS
SPARK PLUGS

GASOLINE TRUCKS **GMC** ELECTRIC TRUCKS

GENERAL MOTORS COMPANY

All Records Broken!

During the month of May (June records not yet available) we received ***more*** orders,

Built more Trucks,
Shipped more Trucks,
Delivered more Trucks,

Than during any month in our history.

All of this in the face of what some people are pleased to call a depression among the concerns who buy trucks.

What's the Answer?

GMC Trucks at our present prices and bought under our square deal policy ***reduce*** the operating expenses of those who use them.

Remember that the ***GMC*** Line comprises both gasoline and electric trucks, in load capacities from 1000 lbs. to 6 tons.

If you are interested in motor trucks, as a dealer or as a user, now, or for the future, you should read "Truck Talk." It will cost you nothing but a request—a postal card will do.

GENERAL MOTORS TRUCK COMPANY

One of the Units of General Motors Company

Pontiac **Michigan**

DIRECT FACTORY BRANCHES:

New York Philadelphia Boston Detroit
Chicago Kansas City St. Louis

GENERAL MOTORS TRUCK CO
Pontiac Michigan
Please send me copy of "Truck Talk"
M. A.

Mosler Vesuvius Plugs

Have no equals for speed and power.

Made to fit any engine, any thread.

Stone Insulation is practically unbreakable.

Unique method of assembly renders Vesuvius Plugs absolutely gas tight and insures perfect adjustment of sparking points.

A. R. MOSLER & Co.
NEW YORK N.Y.

100-R

POWERFUL INDESTRUCTIBLE AND SURE

Powerful because of faultless design.

Indestructible because of the finest materials.

Sure because of methods and workmanship employed in manufacture.

EXCLUSIVE FEATURE

Note ears on collar.

The only plug that has means for assembly without rotating the insulator.

Washer and ears take up all friction of the nut and give the direct straight pressure which makes the plug absolutely gas tight.

Collar takes up friction of nut.

Collar cannot turn when nut is tightened because ears on collar fit into slots in shell.

0631

Studebaker

"SIX" $1575

The Studebaker dealer never has trouble in convincing the buyer of the value of the Studebaker SIX or the Studebaker FOUR.

Starting with the most exacting steel specifications known Studebaker never relaxes in vigilance until the 24 finishing operations have made the body of the car shining and resplendent.

Each and every part, each and every operation, has been made, or performed, in exact and scientific fashion.

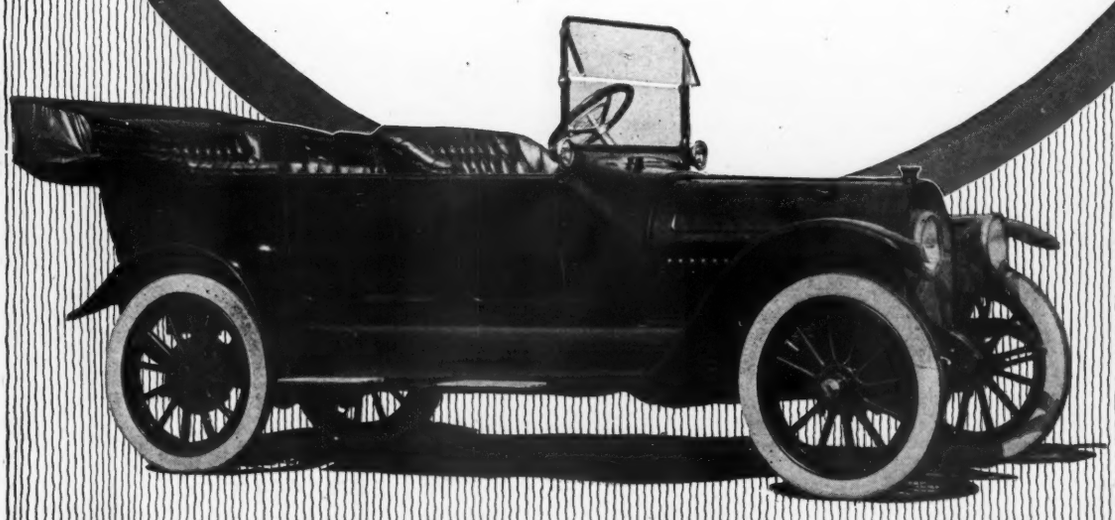
And the parts have been made and the operations performed—BY STUDEBAKER.

Huge quantity alone makes possible the splendid Studebaker-manufactured values at Studebaker prices.

Studebaker
Detroit

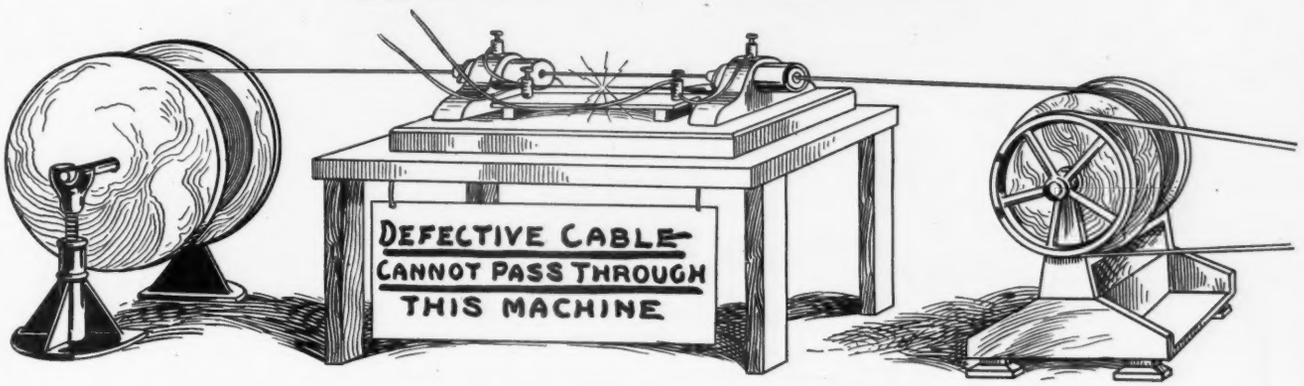
F. O. B. Detroit

FOUR Touring Car.....$1050	*SIX Touring Car.....$1575*
FOUR Delivery Car.....$1150	*SIX Landau Roadster.....$1800*
SIX Sedan $2250	



TESTING

Packard Cable



Preliminary Tests

This machine, patented and used exclusively by us, gives every foot of Packard Cable its last and toughest test before leaving the factory.

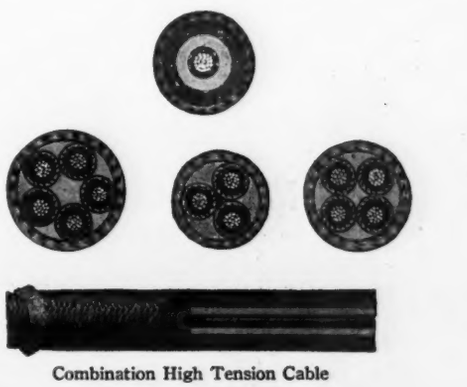
Before this break-down test is given there has been, all during the process of manufacture, most careful inspection of raw materials and thorough tests—the core for mechanical strength and conductivity—the rubber coverings for tensile strength, flexibility and dielectric strength—braids for breaking strength, hardness and weaving quality—the enamel for oil and heat resistance together with flexibility—the completed cable for uniformity in diameter.

Then, as a final make-sure, the cable passing through the machine shown above is subjected to voltage far in excess of any it will ever get in actual service. Any defect in the insulation promptly stalls the machine.

The real test---Service

All these tests are but a preparation for the **real quality** test which comes when the cable is in actual service on the car, motor boat or aeroplane. Here it gets the oil test, the heat test, the vibration test, the use and abuse test—all these a part of the efficiency and life test.

It's the *showing* Packard cable makes in the *service* test that counts with *you*---and with us. The phenomenal growth of our business is proof that the cable *stands* the test.



Combination High Tension Cable

Remember Packard cable has seal brown braids marked with two spiral red stripes—one in each direction. Insist on the "certified cable."

THE PACKARD ELECTRIC CO.

Department C **WARREN, OHIO**

(99)

The Two-Door Body Will Be Popular—

THAT'S the prediction of the Society of Automobile Engineers, a group of men who have a clear insight into the development of the near future.

They missed only on one point—that was in setting the time. They said "next year." Kissel said "this year." **And it is "this year."**

Mounted on the new 48 "Six" chassis, this aristocratic KisselKar body has the advantage of an incomparable chassis. The able, quiet, speedy and economical 4 x 5½ Kissel-built engine is a mechanical triumph. Every other feature that concerns riding and driving quality, sturdiness and accessibility, is in keeping.

You can have the conventional four-door tonneau on this chassis if you prefer —seven or five passenger type. The two-door style is built for either four or five passengers. It's $2350 either way, wire wheels $70 additional.

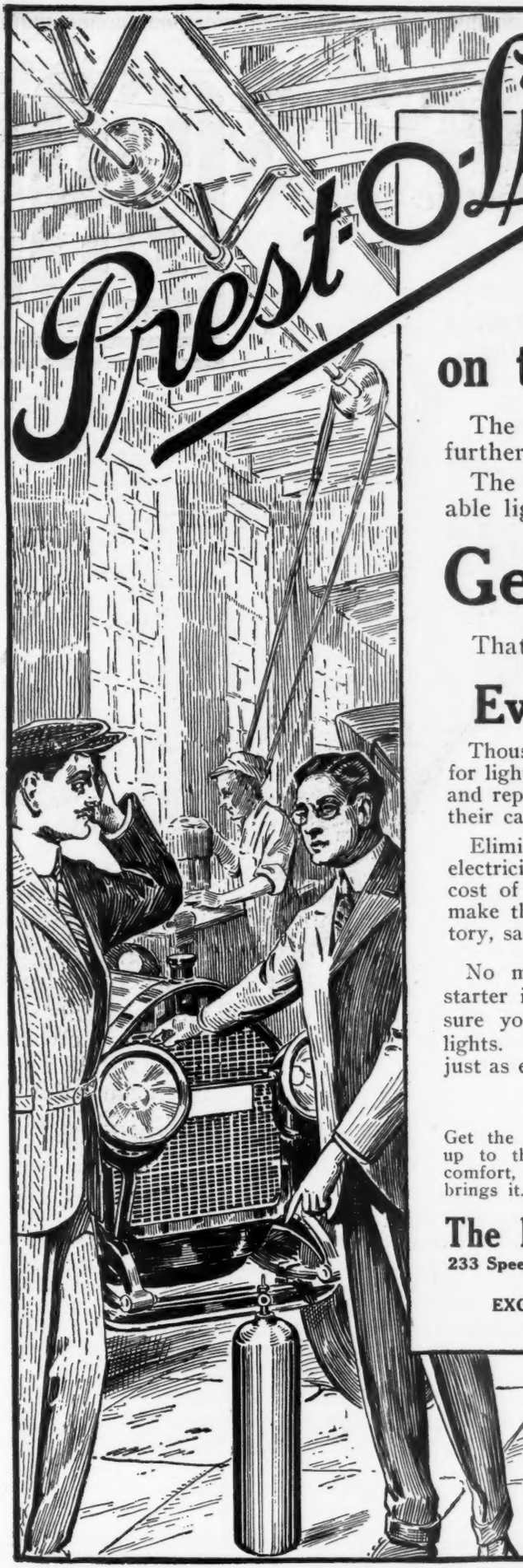
Write for complete information and literature

Kissel Motor Car Company, 121 Kissel Ave., Hartford, Wis.

BOSTON, NEW YORK, CHICAGO, MILWAUKEE, KANSAS CITY, MINNEAPOLIS, ST. PAUL, DALLAS, LOS ANGELES, SAN FRANCISCO, OAKLAND, Philadelphia, Salt Lake City, Detroit, St. Louis, Houston, El Paso, New Orleans, Baltimore, Nashville, Duluth, Buffalo, Pittsburgh, Omaha, Seattle, Hartford, Conn.; New Haven, Albany, Troy, Rochester, Providence, Marshalltown, Ia.; Hastings, Neb.; Madison, Montreal, Quebec, Calgary, and 300 other principal points throughout America.

KISSELKAR

Every Inch a Car



Prest-O-Lite

The Sure Cure for Lighting Troubles

"Don't lose any more time or money on this electric system—

The easiest and best way to save yourself further bother and expense—

The only way to get satisfactory and dependable light—

Get Prest-O-Lite"

That's what the wise repair man says and—

Every Night Proves It!

Thousands of motorists who have tried out electricity for lighting and are tired of paying for constant repairs and replacements are having these systems torn out of their cars and going back to Prest-O-Lite.

Eliminate the useless complication and troubles of electricity—cut down weight—increase power. For the cost of one repair bill or a battery renewal, you can make the change from electricity to the safe, satisfactory, saving service of Prest-O-Lite.

No matter what self-starter is on your car, be sure your lights are gas lights. Reliable light is just as essential as fuel.

Convenience

The Prest-O-Liter, or any other good automatic gas lighter, offers you every "push-the-button" convenience for lighting, dimming or extinguishing your gas lights. The automatic reducing valve prevents the flame from exceeding the proper height.

Use the Coupon!

Get the real facts about satisfactory light today. Wake up to the new meaning of gas lighting with every comfort, convenience and economy. Your address brings it.

The Prest-O-Lite Co., Inc.

233 Speedway **Indianapolis, Ind.**

(Contributor to Lincoln Highway)

EXCHANGE AGENCIES EVERYWHERE

(208)

The Prest-O-Lite Co., Inc.,

233 Speedway, Indianapolis, Ind.

Send complete information on automobile lighting to

.....

.....

.....

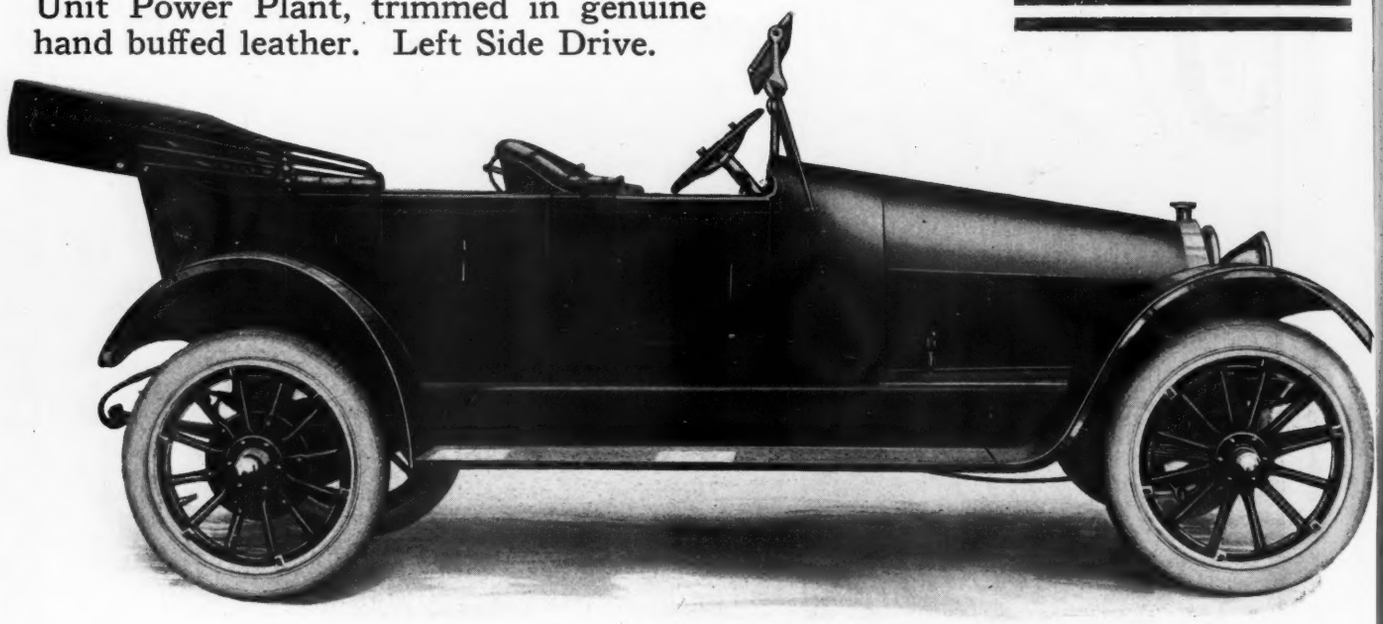
When Writing to Advertisers, Please Mention Motor Age.

METEOR "6-45"

$1295

Completely Equipped with Electric Lighting and Starting System

3¾ x 5 Beaver six cylinder Motor, 126 inch Wheel Base, 35 x 4 Rough Tread Tires, Unit Power Plant, trimmed in genuine hand buffed leather. Left Side Drive.



THE METEOR line for 1915 is composed of a four cylinder, Model 38, and a six cylinder, Model 45. The two cars are the same in design, material and workmanship, and we believe are the ideal car for the average buyer.

In designing these two cars, we have carried in mind the fact that a buyer wants a four cylinder car because of its lower first cost and lower cost of upkeep. The man who wants a large car naturally wants a six cylinder. Both of these Models are equipped with the famous Beaver Motor, 3¾" bore x 5" stroke. The parts of these two motors are interchangeable with the exception of the crank shaft, crank case and cam shaft. The relation of the bore and stroke makes a perfectly balanced motor and one which develops wonderful power at low engine speed.

The Meteor is not a new car, as it is now in its second year and is manufactured by an organization that has been interested in manufacturing cars for the past eight years. The parts entering into its construction are absolutely standard and there has been no attempt to develop anything new. The essential parts entering into the construction of a motor car are the radiator, motor, clutch, transmission, and rear axle. With these parts properly designed and manufactured, we have the foundation of a motor car which will give perfect satisfaction. The past year or two, millions of dollars have been spent by some automobile manufacturers advertising certain features which are of secondary consideration and, as a rule, you will find the average sales talk has more to do with the equipment and accessories than with the essential parts of the car.

We are using the same motor, clutch, transmission, and axles for 1915 that we have used for the past year and with 400 cars on the market we have not sold nor given away one dollar's worth of repairs covering these parts with the exception of one inlet valve cover which was ruined by a Meteor owner attempting to use the wrong size spark plug.

We believe the above is a record that very few manufacturers can equal and are, naturally, very proud of the success our cars have met with in the hands of their owners.

METEOR "38" $1050

Completely Equipped with Electric Lighting and Starting System

3¾ x 5 four cylinder Beaver Motor, 114 inch Wheel Base, 32 x 3½ Tires, Unit Power Plant and Left Side Drive.

NO DEPOSITS

We have developed a selling plan which eliminates deposits on cars for future delivery. Our plan protects the dealer as well as ourselves. Our proposition is especially attractive to dealers who are now buying through distributors. We have some splendid territory open in Indiana, Illinois, Ohio, and Iowa. The METEOR Six is the best selling proposition on the market, and at the remarkable low list price of $1295 will be a splendid selling proposition. It is not a cheap small six, but has the wonderful Beaver 3¾ x 5, 45 H. P., unit power plant, a wheel base of 126", and 35 x 4 rough tread tires. Cylinders are cast in pairs, aluminum crank case with four bearings, Stromberg carbureter, and has deep Turkish upholstering of genuine hand buffed leather.

WE ARE NOW MAKING 1915 CONTRACTS, AND A WIRE OR LETTER WILL BRING FULL DETAILS.

THE METEOR MOTOR CAR COMPANY

PIQUA, OHIO, U. S. A.

Cable Address "MAXCO"
WESTERN UNION LIEBER'S AND
A.B.C. 5TH EDITION CODES.

MAXWELL MOTOR SALES CORPORATION

AUTOMOBILES

WOODWARD AND WARREN AVENUES

EXECUTIVE AND SALES OFFICE

DETROIT, MICH

June
26th
1914.

THE NEW 1915 MAXWELL "25."

EXTREMELY IMPORTANT TO DEALERS IN AUTOMOBILES.

Between July 15th and August 1st we shall announce,- place upon display and exhibit our new 1915 Maxwell "25," to retail at $750.

We shall begin the distribution throughout the country of this new 1915 "25" model by August 1st.

We confidently expect to be able to build 60,000 of these new 1915 "25" models retailing at $750. within one year.

We shall do all that human endeavor and our immense factory facilities can do to build at least 60,000.

I confidently predict that this new Maxwell "25" retailing at $750. will be the greatest sensation that the automobile world has ever known.

I base this prediction upon the car from the ground up - its chassis; its motor; the lines and size of its body; and the unexpected extra and additional features which will be placed upon this car.

Walter E. Flanders.

President,

Maxwell Motor Co., Inc.

On Country Road or City Street

—the safest, strongest, speediest tires—for any make of car.

PENNSYLVANIA Oilproof VACUUM CUP TIRES

Show your tire customers the stout, massive cups of tensile rubber—knobs that dig down in soft roads and prevent sliding; knobs that resist the grinding wear of rough going.

Show them the guarantee that these tires will not skid on wet or greasy pavements. And the 4,500 mile guarantee that is invariably exceeded in average service.

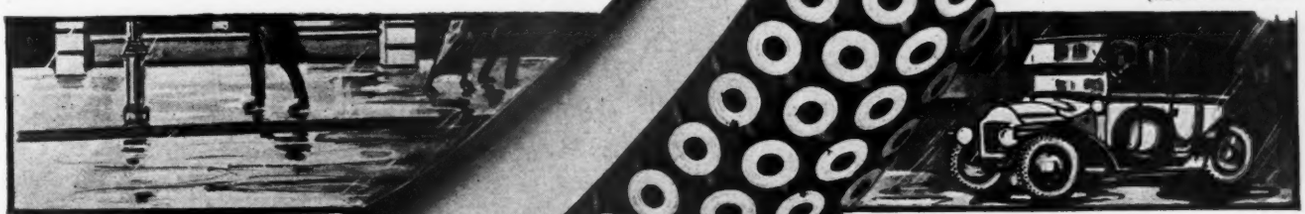
These qualities SELL tires—in the hands of the wise salesman.

PUREGUM Red Inner Tubes

absolutely the highest quality tube on the market. The most durable, resilient, lasting tube you could possibly carry.

Attractively displayed in black rubberized bags in red boxes.

NON SKID TRADE MARK REG. U.S. PAT. OFF.



Pennsylvania Rubber Co.
Jeannette, Pa.

New York, Chicago, Cleveland, Seattle, Boston, Pittsburgh, San Francisco, Los Angeles, Detroit, St. Paul, Dallas, Minneapolis, Omaha, Kansas City, Mo., Atlanta

An Independent Company with an independent selling policy

EISEMANN

Under extreme conditions Eisemann Magneto efficiency and dependability usually shows the strongest. With the wonderful performance of the Eisemann Magnetos in the Indianapolis to the Pacific tour (11 perfect scores out of 11 entries) still in mind along comes the report from the Henderson Round-The-World-Car in Germany that the Eisemann is performing perfectly. The reproduction herewith from "Motor Age" tells the story.

Bear in mind that such tests as these carry greatest weight for here your magneto must perform under all varying conditions of climate, speed and road. It is also interesting to note that this trip around the world is being made with Kerosene as the fuel.

This imposes still another labor on the magneto for a Kerosene mixture is not so easily ignited as a mixture of gasolene.

It matters not what the test may be, or where, Eisemann efficiency and Eisemann dependability are sure to be in evidence.

Eighty-three producers of motor driven apparatus in the United States are now using Eisemann as standard ignition, of which eighty-three, fifty are truck makers.

The Eisemann Magneto Co.

Sales and General Offices
32-33d St., Brooklyn, N. Y.

New York City 123 W. 52d St. | Indianapolis, Ind. 514 N. Capitol Ave. | Detroit, Mich. 802 Woodward Ave.

Magneto on Henderson "Round-the-World" car is repeating performance of Indianapolis to Pacific tour Eisemann Magnetos — performing perfectly and with clean score.

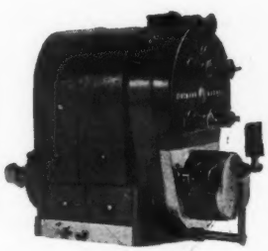
...ished ... ...ore reaching ...
ground.

Inspect Globe-Girdling Car

The parent factory of the Eisemann Magneto Co. is located at Stuttgart, where the Henderson was again welcomed by those who had seen it in New York before departure. Our magneto was found to be still in splendid working order, although it had not had any attention since the beginning of the trip. As we were among friends here, we took the opportunity of overhauling the car in anticipation of the long journey still before it.

To our surprise, we found that the cylinders were not at all carbonized in spite of our large mileage and the use of kerosene as an explosive.

From *MOTOR AGE*



$9.50 to $15.00

SPARTON

ELECTRIC MOTOR DRIVEN AND HAND OPERATED SIGNAL

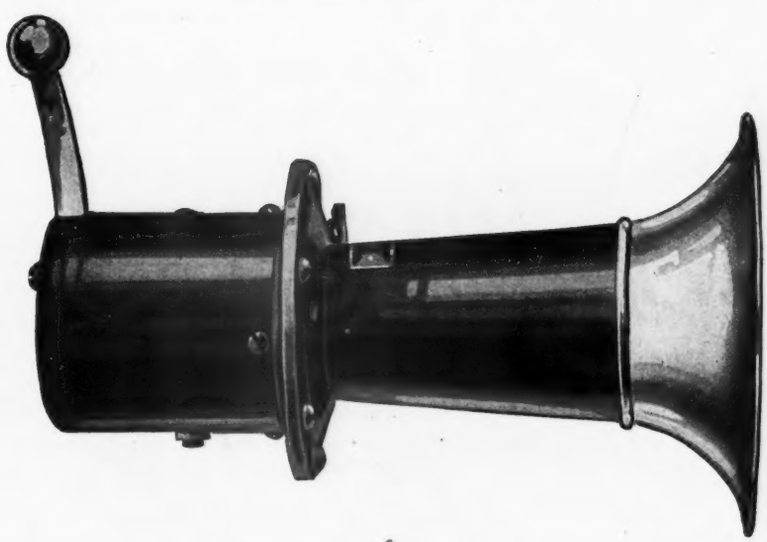
The motorist cannot afford to depend on a good enough warning signal. When the time comes for action, he must have a horn that will compel quick, unthinking, instantaneous jumping—such is the discordant, action-compelling growl of the SPARTON when the button is pushed home. On country stretches a good pressure on the button produces a warning clarion that can be heard a mile down the road, giving everyone time to get out of the way. On city streets a light touch produces an inoffensive, but authoritative command, warning people at close range.

Hand Operated

$7.00

and

$8.00



Hand Operated

$7.00

and

$8.00

The Sparks-Withington Co., Jackson, Mich.

Where Could You Buy More?

Study the complete equipment that goes with a Glide Model 30—study the guarantee that backs the materials and construction—then ask yourself where could $1195 buy more?

- Westinghouse Electric Starting, Lighting and Ignition System
- Unit Power Plant
- Long Stroke Motor
- Center Control
- Left Side Drive
- Gasoline Tank Under Cowl Dash
- 114 Inch Wheelbase
- Motor Driven Tire Pump
- Floating Rear Axle, with Pressed Steel Housing
- Demountable Rims
- Tire Irons for Extra Tire
- Stream Line Body with Concealed Hinges and Built-In Windshield

And, with the above, the prices includes *Top, Electric Horn, Stewart Speedometer, Spare Demountable Rim Jack, Tool Kit and Flash Lamp*

The Model 30 Glide offers everything you could ask for in style and comfort, and its daily use everywhere proves that it provides all you want in power and endurance. Write for catalogs. Ask for catalog on Glide Model 36, selling at $1840.

Dealers: Let us tell you how easily and satisfactorily you can make good profits with the Glide agency. Please write us.

The Bartholomew Co., 215 Glide St., Peoria, Ill.

Mr. Live Dealer:—

Let E. Z. Rider Bring You Business

Have you stopped to consider the business you are losing by not having the sale of

E. Z. RIDER SHOCK ABSORBERS FOR FORD CARS

With the hundreds of thousands of Ford cars in use there's an enormous field of business on E. Z. Rider waiting for Live Dealers. Our dealers are doing a big business on E. Z. —and making a big profit.

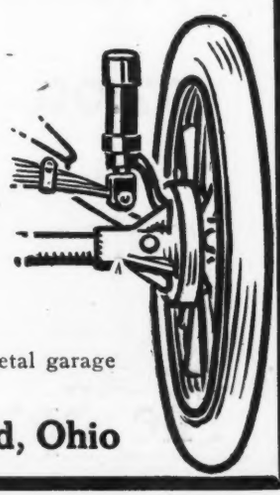
E. Z. Sell Themselves

It's no job at all to sell E. Z. RIDER. They literally sell themselves to Ford men. Show E. Z. and explain what they save and what they do and the sale is made. And not only that, but every set of E. Z. you put out will sell dozens of other sets for you, because they give supreme riding ease and entire satisfaction to users.

$15 Set of Four

SPECIAL FEATURE

The superiority of E. Z. RIDERS is very apparent—they work on a ball and socket joint, which gives the springs a straight pull at all times, insuring free and easy action; made from the highest quality of materials: take the place of spring brackets and hold springs in same position: sensitive spiral springs absorb all jar and vibration: no trouble: light weight: easy to install. Do not interfere with chains or steering.



Get our Special Dealers' Proposition quick and get this business in your town

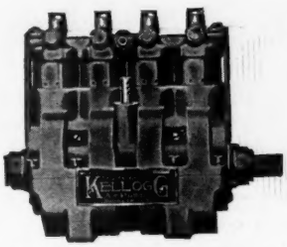
Dealers' Sales Helps

We send advertising cuts, newspaper ads., motion picture slides, metal garage signs, metal fence signs, circulars, etc., free of charge.

The Forest City Electric Co., 5014 Windsor Ave., Cleveland, Ohio

The Last Word In Equipment

If you ask for a demonstration of a new car, see if the dealer has a Kellogg pump on it. It is an indication that the car is built and equipped for your comfort and convenience. If you are driving an old car without a starter or if you have an old car that you want to sell, write us about a Kellogg Air Starter Unit and Tire Pump for installation on that car.

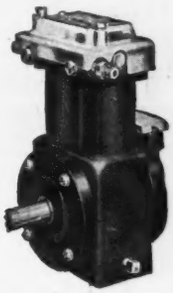


Made with attachments ready to install on over 30 different cars. Built like an engine.

Engine Driven KELLOGG Air Pump

One, Two, Four, Six Cylinder Models

With Attachments and Instructions, Ready to Install



2-Cylinder Pump with Attachments for Buick "25", "26", "37"; Mitchell "4" and "6"; Overland "59", "69", "79"; Reo "5"; Stutz "4" and "6". Complete Cost, $26.

You do not have to have misfit gears made. We furnish everything so that it takes but a short time for your dealer or garage-man to make the installation. You cannot afford to install any pump but the one that is standard or special equipment for these cars:

Packard	Franklin	Imperial	Howard
Peerless	Winton	Jackson	Mitchell
Stevens-Duryea	Havers	Lexington	Fiat
Lozier	Stearns	Chandler	Speedwell

and made with special attachments that any dealer can install on the

Chalmers 1914	Studebaker Six	Pierce	Simplex
Hudson	Buick	Cadillac	Henderson
Maxwell 6	Overland	Reo	Oakland
Abbott	Stutz	Cole	

Send name, model of car and name of your dealer and get full particulars

KELLOGG MFG. COMPANY, 114 Circle St., Rochester, N. Y.

New York **San Francisco** **Detroit** **Chicago**

Air-Starting Units made for all the above named cars

Air Starter Unit for Ford Cars

TOUR IN COMFORT

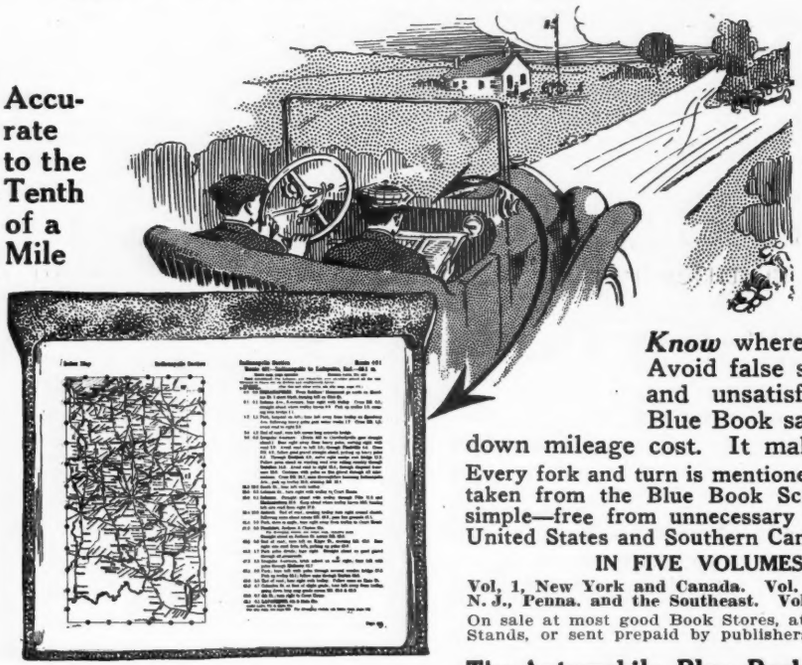
"20.3 m. Fork at Schoolhouse on left, bear right"

with the

AUTOMOBILE BLUE BOOK

The Standard Road Guide of America

Accurate to the Tenth of a Mile



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Know where you're going and how to get there. Avoid false starts—wrong directions—bad roads—and unsatisfactory hotel accommodations. The Blue Book saves its cost in a single day by cutting down mileage cost. It makes touring a constant delight.

Every fork and turn is mentioned in unmistakable terms. Distances are all taken from the Blue Book Scout Car Speedometers. Maps are clear—simple—free from unnecessary detail. The Blue Books cover the entire United States and Southern Canada.

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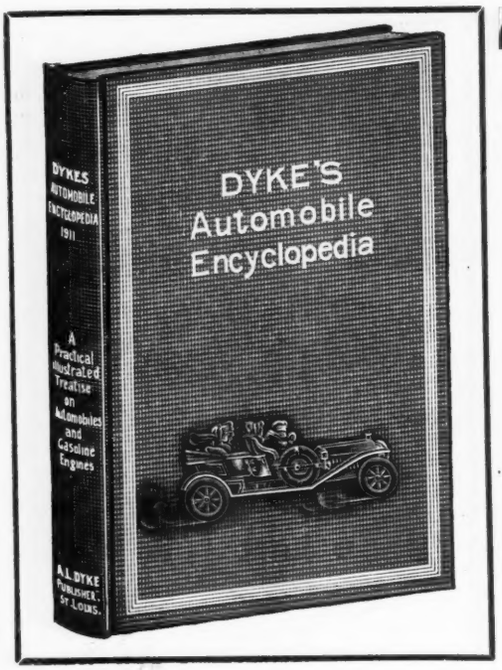

Dyke's Automobile Encyclopedia

is a simple, practical book written by A. L. Dyke, publisher of the first practical treatise on automobiles in America. This revised and enlarged Edition is especially prepared for those who want to learn the principle and construction of all parts of all cars, thereby enabling one to make repairs and adjustments in an intelligent manner.

This book explains the principle and construction of different ignition, carburetion, cooling and lubricating systems, together with the different types of engines and their valve systems; how to set valves, time the ignition, etc.

THE DIGEST OF TROUBLES is very complete—by turning to the index the CAUSE and REMEDY of the trouble is given.

THE ADJUSTMENT AND REPAIR SUBJECT is probably the most interesting. The subject of repairing begins with cleaning a car; cleaning carbon, chemically and mechanically; grinding valves; testing compression; taking up lost motion in valve stems and plungers; setting valves and timing the ignition; how to set all leading magnetos; scraping bearings; how to test for knocks and how to locate them; meshing the timing gears; fitting piston rings; carburetor repairs and adjustments; rewiring a car; ignition troubles and remedies; timer troubles and remedies; cooling troubles; how to clean and repair radiators; how to take up wear in differential; how to adjust the steering device; how to treat the clutch; lining up wheels, etc.

OTHER SUBJECTS—such as Building a Garage for Home or Business; Equipment of a Shop; Tires; Tire Repairs; Vulcanizing; Lighting a Car; Self-Starters; the Assembly of a Car; Transmission; Axles; Brakes; Differentials; Laws; Insurance; Metric Measurements Connected with English Measurements; Care of a Car.

ANOTHER FEATURE OF THE BOOK is the building-up process of a car, from the axles to the body; each part is added by means of progressive charts: First the springs are mounted on the axles, then the frame, then the power plant is mounted on the frame and each and every part is added until the car is completed. In this manner the reader learns the relation of one part to the other. The engine and transmission are assembled in the same manner.

THIS BOOK IS DIFFERENT. The matter is arranged in the form of instructions, of which there are 40. The type is clear. There are over 1000 illustrations, in the form of large, clear charts, of which there are 239. The reading matter is so clearly worded, a ten-year-old boy can understand.

1914 EDITION NOW READY, with 86 pages, 107 illustrations and 118 questions on the principle, construction and care of Electric Starting, Generating and Lighting Systems.

Price Three Dollars *postage prepaid*

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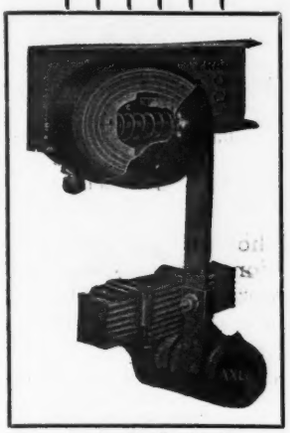
Read These Reasons Why



GABRIEL SNUBBERS

are Standard Factory Equipment on the Easiest-Riding Cars: White, Peerless, Stearns, Oldsmobile and Lozier and are used in increasing quantities by practically **all** the leading car builders.

The **only** device that retards only the up-stroke of the springs, preventing abrupt or excessive rebound—the cause of jolts and jars.

Passengers ride in comfort **on** the seat instead of being tossed **from** it.

On smooth roads Snubbers offer no resistance to gentle spring action so necessary to full riding ease.

Ask the Engineering Department of YOUR car—they know what Snubbers will do. Write and let us send you catalog.

Gabriel Horn Mfg. Co., 1415 E. 40th St., Cleveland, Ohio

New Departure Ball Bearings

A Fair Question Deserves a Fair Reply

IN designing your next car, the question of bearing equipment will, of course, receive the serious consideration so important a question deserves.

In all fairness, New Departure ball bearings more than answer that question.

It is a bearing of guaranteed quality, including high grade materials, accuracy of finish, and uniformity of dimension. It is the product of an American factory with ample capacity for prompt and complete deliveries without liability of troublesome delays such as are sometimes experienced by manufacturers who buy their bearings abroad.

Why not give New Departures a thorough tryout?

A line from you will bring our literature and representative. May we send either or both and inform you fully of our proposition?

The New Departure Manufacturing Company, Bristol, Conn.

Western Branch, 1016-17 Ford Bldg., Detroit, Mich.

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ESTABLISHED NOVEMBER 12, 1805

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PEREMPTORY AUCTION SALE
Valuable Machinery and Equipment

Formerly of the

R. C. H. CORPORATION—Bankrupt

DETROIT, MICH.

Tuesday and Wednesday, July 21st and 22nd, 1914, at 10 o'clock A. M. each day on the premises.

Also Trustee's Sale of

REAL ESTATE, CARS, GOOD WILL, DRAWINGS, PATTERNS, REPAIR PARTS, ETC., of the

HUPP-YEATS ELECTRIC CAR CO.

DETROIT, MICH.

Wednesday, July 22nd, 1914, at 12 o'clock M., on the premises.

The sale of the R. C. H. Corporation includes Machine Tools, Engine Lathes, Drill Presses, Universal Milling Machines, Turret Lathes, Grinders, Gleason Gear Cutters, Screw Machines, Shapers, Hack Saws, four 2500 pound Drop Hammers, Trimming Presses, Annealing Furnaces, Belting, an enormous supply of small tools such as twist drills, reamers, gauges, cutters, 400 tons of round, flat, bar and forge iron and steel in commercial sizes, etc. Machine tools and small tools both to be sold in separate lots only.

The sale of the Hupp-Yeats Electric Car Company will be in three parts: (1) The real estate; (2) the good will, repair parts and right to supply same, patterns, jigs, dies of the Hupp-Yeats Car Company as a going concern; (3) nine Hupp-Yeats Electric Cars each separately.

Catalogues will be mailed and all information given on application to the auctioneer.

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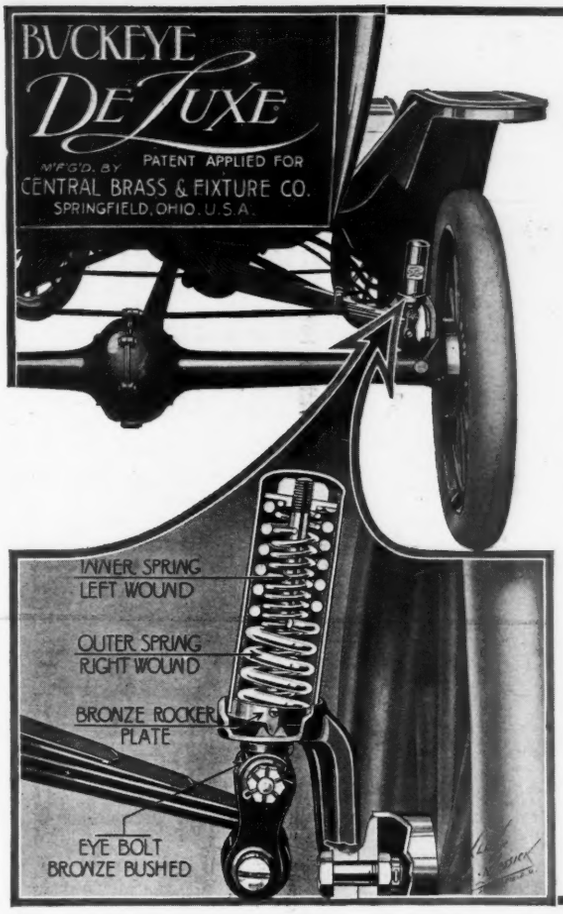
Trouble Hunts Among the Floats

MANY diverse operations are necessary in turning out the high grade Zenith Carburetor. Not the least important of these lies in the testing of float and float chamber under actual working conditions.

On long racks the carburetors are set up with floats and needle valves in place. Temporarily attached to each float chamber is a gauge glass, showing the level of the gasoline. The operator adjusts the gasoline valve to the required level and thoroughly tests the float action. Leaks in the castings are also noted. Nothing "gets by" these Zenith inspections—there is too much at stake.

FOUR large factories in four different countries are busy turning out the Zenith. The leading cars of Europe use it. Nine prominent American makes are already converted. In export fields alone the Zenith equipped car has tremendous prestige. You can learn why in the catalog. Ask for it.

ZENITH CARBURETOR CO. DETROIT, MICH.



The Buckeye De Luxe Shock Absorbers

Add the pleasures and comforts of **easy riding** to the dependability of your Ford car. Don't let "car fatigue" caused by rough roads spoil a day's motoring enjoyment. Equip **your** Ford car with—

Buckeye DeLuxe Shock Absorbers

They knock the shock—give perfect results on any road, under any load. Constructed of best materials obtainable, including drop forgings, bronze rocker plates and bronze bushings. Unlike other shock absorbers, they never sway when taking sharp curves. However rough the road, the downward motion on their spiral springs is **always at right angles.** Can be attached in one hour by any Ford owner.

Price per set of 4, $15.00. Per set of 2, $8.00. In ordering specify whether for Touring Car or Roadster.

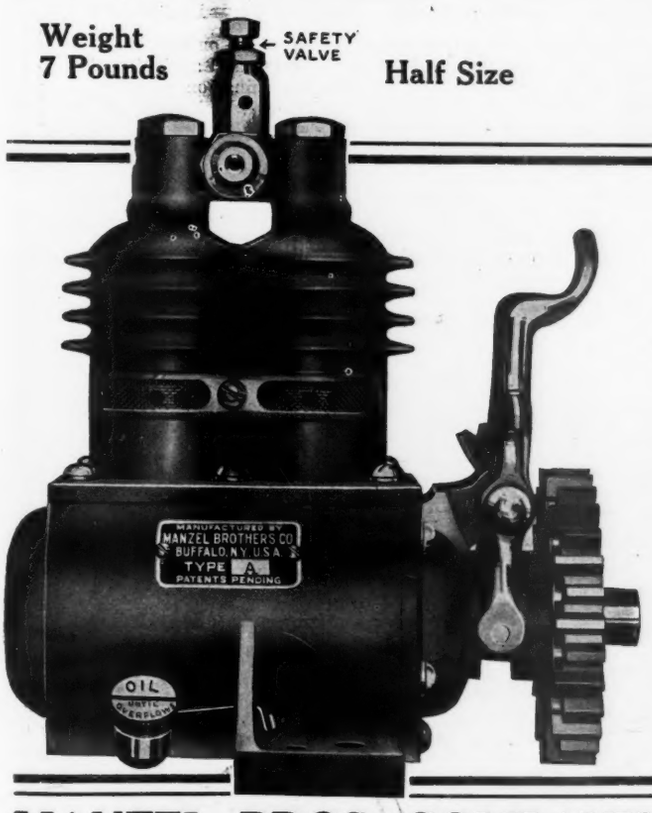
Order through your dealer or sent direct prepaid on receipt of remittance. Absolutely guaranteed.

Dealers and Jobbers Wanted Everywhere

MANUFACTURED BY

The Central Brass & Fixture Co., Springfield Ohio

Weight 7 Pounds



Half Size

MANZEL
ENGINE DRIVEN TIRE PUMP

ARE YOU GOING TO HAVE A SUMMER TOUR?

If so, by all means take tire comfort with you. When away in the hills, far from garage and compressed air, then alone can you feel the satisfaction of having a MANZEL PUMP on your car.

The MANZEL can be attached to almost any car. It utilizes the power of the motor, lets your motor run on four or six cylinders and drives a steady stream of fresh air into your tires while you sit and watch it.

The installation of a MANZEL ENGINE DRIVEN PUMP on your car is a simple matter. We carry fittings in stock that make the MANZEL ready for immediate attachment to Abbott-Detroit, Buick, Cadillac, Cole, Cartercar, Chalmers, Hudson, Howard, KisselKar, Maxwell, Mitchell, Oakland, Overland, Packard, Paige-Detroit, Reo, Speedwell, Studebaker, Stutz and other cars.

MANZEL BROS. COMPANY, 306 Babcock St., Buffalo, N. Y.

The People You Meet At The McAlpin

THE distinctive patronage of the Hotel McAlpin adds measureable increase to the pleasures of your visit in New York.

Preferred by people prominent in the city's life because ideally situated among the theatres and shops, the restaurants and salons of the McAlpin are socially brilliant amid an atmosphere of marked good taste.

Superior cuisine—dainty rooms—trained service of high intelligence—all these are made more than ever enjoyable by tariffs that are notable for their moderation.

Stay at the McAlpin when you are in New York. Only a block from the Pennsylvania Terminal and a short distance from the Grand Central Station, you will be at the very hub of New York's transportation system—with every convenience and comfort that the largest and safest hotel in the world can give you.

Management of MERRY & BOOMER

HOTEL McALPIN

Herald Square

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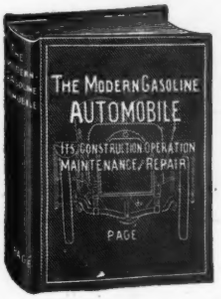
Nearer *than* Anything *to* Everything

New, Revised and Enlarged Edition,
Showing All Recent Improvements.



The Modern Gasoline Automobile

Its Construction, Operation, Maintenance and Repair

By VICTOR W. PAGE, M.E.

11 LARGE FOLDING PLATES
Over 800 Pages *575 Illustrations*

Price $2.50

A late and complete treatise on the Gasoline Automobile. Written in simple language by a recognized authority, familiar with every branch of the automobile industry. Free from technical terms. Everything is explained so simply that anyone of average intelligence may gain a comprehensive knowledge of the gasoline automobile. The information is up-to-date and includes, in addition to an exposition of principles of construction and description of all types of automobiles and their components, valuable money-saving hints on the care and operation of motor cars propelled by internal combustion engines.

To the 1914 Revised Edition

Entirely new material has been added on tractors in three and four wheel forms, cyclecars and agricultural tractors or automobile plows; combination gasoline-electric drive, front-wheel and four-wheel drive and steer systems and other important developments in power propelled vehicles. The discussion of power transmission methods has been augmented by consideration of the skew bevel gear and two-speed direct drive rear axle, as well as several new forms of worm gear drive. The subject of electrical motor starting systems has been considered at length and all leading systems and their components described. A discussion on ball and roller bearings, their maintenance and installation, has also been included, and a number of other features of timely interest such as latest types of gasoline and kerosene carburetors, cyclecar power plants, the Fischer slide valve motor, detachable wire wheels, etc., have been added to bring the work thoroughly up to date.

The book tells you just what to do, how and when to do it. Every part of the automobile, its equipment, accessories, tools, supplies, spare parts necessary, etc., have been discussed comprehensively. If you are or intend to become a motorist, or are in any way interested in the modern gasoline automobile, this is a book you cannot afford to be without.

Not too Technical for the Layman—
Not too Elementary for the More Expert

CLASS JOURNAL COMPANY
910 S. Michigan Avenue Chicago, Illinois

(15)

Every Tuthill Spring Passes a Series of Rigid Tests

Before a Tuthill Titanic Spring leaves the factory it passes through a series of rigid tests. These tests show that each Titanic is strong enough to withstand harder service than it ever will be called upon to bear in actual everyday use. The slightest imperfection cannot escape the tests given by machine and man—therefore with a Tuthill Titanic under your car you have the utmost in riding comfort—no jolts, no jars, no shocks—with the absolute elimination of spring breakage.

Tuthill Titanic Unbreakable Spring

Guaranteed Absolutely Against Center Breakage

Tuthill Titanic Springs are guaranteed unreservedly against breakage at the center—the place where 75% of all springs snap. The regular guarantee covers the rest of the spring—but the carrying and lasting qualities of Tuthill Titanics can always be depended upon.

Tuthill Special Repair Service

The Tuthill Titanic is unbreakable. But motorists using other springs need no longer lay up their car because of a broken spring. Our Service Department is prepared to express, on a moment's notice, a spring for practically any model of any car. Wire or write—prompt service.

Thus dealers can give their customers the prompt service they demand. And giving them a *far* better spring than the one that broke—The Tuthill Titanic—they build up a big replacement business. The price for a Tuthill Spring is lower than other springs of the same high quality—the repair man makes a larger profit—and the car owner gets a better spring.

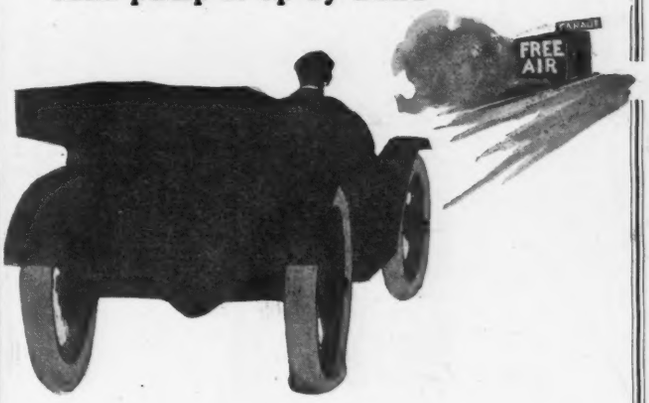
The automobile spring that can be depended to give the motorists every possible comfort, not only in ordinary service, but under the most severe and trying conditions, is the Tuthill Titanic. No dread of spring breakage with a Tuthill Spring under your car. Write for price list.

TUTHILL SPRING CO.

762 Polk Street Chicago

1726

"I'd rather ride in on a soft tire than pump it up by hand"



Ruin One $40 Tire and You've Paid Four Times Over for a

MAYO SPARK PLUG PUMP

Every yard you ride on a soft tire costs you money. Every bump you take drives your rim into your casing like a knife. Small stones in the road over which a properly inflated tire rides without injury, chew the tread off a soft tire in no time.

Although motorists know these things to be facts, they often prefer spoiling a tire to spoiling their temper and motoring pleasure by sweating and straining over a back-racking hand pump. **No motorist will use a hand pump unless he absolutely has to.** This horror of hand pumping is the chief cause for rim cuts, blowouts and short mileage tires.

Motorists dislike hand pumping because they have to work **with** a hand pump. A hand pump will do nothing unless it has two strong arms back of it.

The Mayo Pump works **for** the motorist. It lets the motor do the work. **You** take it easy, seated on the running-board or under a shady tree. The Mayo pumps pure, fresh air only. Built with metal rings like a motor and will last as long. Attached by substituting for any convenient spark plug. Can be carried anywhere in the tool box.

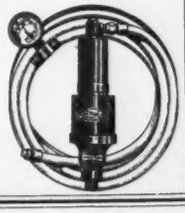
Price, complete with pressure gauge, 10 ft. hose, all connections, $10.00.

Mayo Quick Detachable Spark Plug, $1.50 extra.

Try a Mayo Free on Your Car For 30 Days

COMPLETE $10 WITH GAUGE

Mayo Mfg. Co.
55 East 18th Street
Chicago Illinois



$ MAKE 250.00 A MONTH Repairing AUTOMOBILE Tires

Sounds like a lot of money —IT IS—A WHOLE LOT of MONEY to be earning CLEAR every month—yet it's what hundreds of men we have established in the Automobile Tire Repair Business are making. You let down the DRAW BRIDGE for SUCCESS to enter into your career by getting into business for yourself. The business for you is the one where investment is small—the returns quick and for cash—where the margin of profit is large—the demand for your PRODUCT or SERVICE constant and ever on the increase.

A HAYWOOD TIRE REPAIR EQUIPMENT

answers to all of these requirements of Old Dame Fortune—The certainty of success in this business is as sure as anything in this world can be—Each year adds thousands of new Automobile Owners—they need YOU to keep their tires in service.

Here Is Your Opportunity!

Be first to enter this new, big paying business in your town. Open your pockets. Let the dollars pour in. Act quick. Every auto sold means more tires to mend. Automobile business is growing fast—enormous field for tire repairing. Punctures and blowouts are common. Tires need retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every corner—all making money—busy day and night. Autos make same proposition over again—only ten times bigger and better. Users of Haywood Tire Repair Plants are making big money. Johnson, Tex., writes: **"I have made as high as $18 in a day."** Another man who bought a plant September, 1911, writes he has **cleared over $3000.00.** That's going some! Operate a plant as side line in connection with auto business—garage or as an independent business. Find neighborhood where there's a bunch of autos—get all the steady business besides transient work. Experience unnecessary. You learn quick. Simply follow directions—practice a few days on a couple of old tires and you'll be ready to coin money. Business comes fast and easy.

Repair Tires At Home

Young men! and boys repair father's tires—get money he pays garage man. Get the neighbor's work. Make money to attend college or to start a garage and repair business.

Auto Owners—Repair your own tires—save money—pay for your outfit in short time. We have outfits for home use. Anyhow, investigate. Send today for catalogue. See the wonderful possibilities in this marvelous field. Learn of the enormous money-making opportunities in this fascinating new business.

The New Money-Making Business —Start Now—This Man Is Making Money

Haywood Tire & Equipment Co.
720 N. Capital Ave., Indianapolis, Ind.

Gould Storage Battery

AN official of a large steel company who has several electric vehicles and has had batteries of other make, wrote to our Chicago representative as follows:

"I want you to get my batteries and fix them up in good shape. I prefer to deal with you again as your batteries have given such excellent satisfaction that I want to continue using them. I will let you know later when I want you to replace the batteries in my other car."

Please remember, too, that the Gould Battery is backed by one of America's strongest manufacturing organizations—one that has had fifteen years' experience in battery work alone.

Our desire to help you is sincere, and careful investigation would soon confirm the logic of our claims of extremely long battery life, high capacity and thorough service satisfaction.

The improvement possible in your car will be explained if you tell us its make, model and the mileage now obtainable. Wouldn't it pay you to investigate?

Gould Renewals fit any battery jars.

Ask at least for our booklet, "What Gould Vehicle Batteries Are Doing."

Gould Storage Battery Co.

General Offices: 30 E. 42d St. New York City
Works: Depew, New York

Boston—14-16 Cambria St.
Philadelphia—613 Betz Bldg.
Cleveland—1761-5 E. 18th St.
Detroit—88 E. Congress St.
Chicago—The Rookery
San Francisco—1448 Van Ness Ave.
Los Angeles—110 E. Pico St.

Agents in
Washington, Rochester, Buffalo, Pittsburgh, Milwaukee, Minneapolis, St. Louis, Kansas City, Omaha, Denver, Topeka, Seattle

CANADIAN REPRESENTATIVE:
R. E. T. Pringle, Toronto, Montreal, Winnipeg, Vancouver

Full stock of parts, plates and repairs carried by all offices and agents. 105

McCadden Leak-Less PISTON RINGS

By the installation of new automatic machinery we are now able to produce our rings in quantity lots, at a material decrease in cost.

FOR SPEED

As a result we are making a 20% reduction in the price of our rings to consumers, dealers and jobbers.

FOR POWER

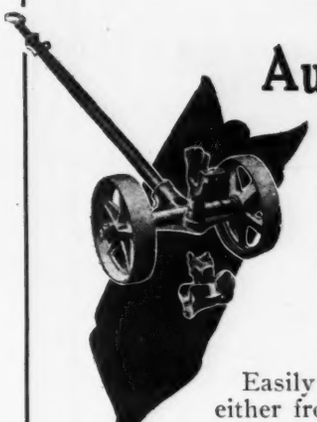
By decreasing prices we are increasing sales.

FOR ECONOMY

All quotations submitted prior to June 1st are now subject to an extra reduction of 20%. Take advantage of this. Satisfaction guaranteed. Dealers and jobbers wanted. Write.

McCadden Machine Works
St. Cloud Minnesota

Use the WEAVER Auto Ambulance



"For Crippled Cars"

"Break-down jobs" are no bugbear to the repair man equipped with a Weaver Ambulance.

Easily and quickly attached to either front or rear axle — full range of adjustments to meet every condition — strong, compact, but comparatively light; easily handled by one man.

This is the only **scientifically designed** equipment of this nature ever perfected. It is very rugged and will stand the severest service in the city or on country roads.

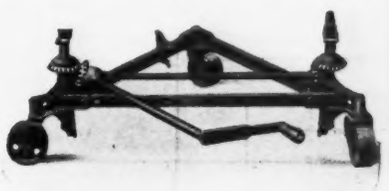
The clamping mechanism is designed to attach to any type of front or rear axle and will hold the ambulance rigidly in position so that the car may be towed at a high rate of speed without fear of accident.

Roller Bearing Wheels make it easy to transport the heaviest cars, and wheels are sufficiently high and wide to operate with entire satisfaction on rough country roads. 1¼-inch steel axle; telescoping steel tongue.

Shipped assembled ready for service. Weight, 150 lbs.

List Price, $30

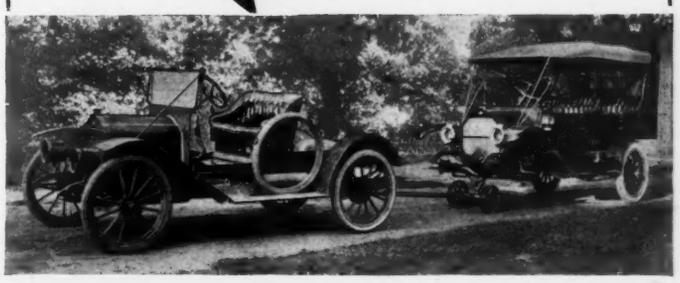
WEAVER Auto Twin-Jacks



Will save money for you every hour of the day. Indispensable for manipulating autos in Garage, Repair Shop, Wash Room, Storage Room, or in unloading from freight cars. Ball and roller bearing throughout.

Two, one for each axle.....**$20.00**
Single Jack, as above..... **12.00**

Weaver Mfg. Co.
2165-79 South 9th Street
Springfield, Illinois



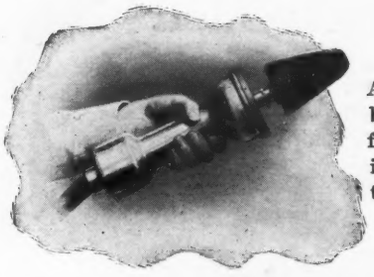
Ford
THE UNIVERSAL CAR

Model T Runabout $500
Model T Touring Car 550
Model T Town Car 750

With Full Equipment f. o. b. Detroit

FORD MOTOR COMPANY
Detroit, Michigan

Car *Cleaned* in 15 min!



A marvel time-and-labor saver; four times faster than hand washing yet harmless to the finest finishes.

The WIZARD WASHER

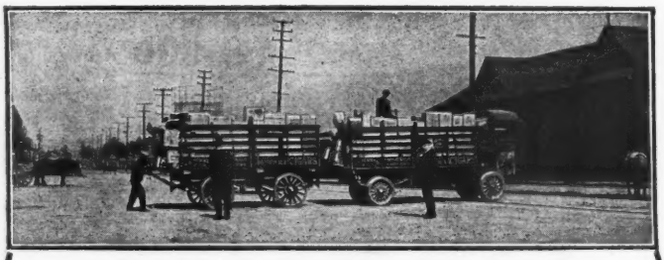
Saves 75% of the time, labor, muss and fuss of washing autos, carriages, trucks, etc.—*powerful* enough to remove the driest mud, yet *gentle* enough not to scratch the finest mirror finish. A compact, light, simple device—a unique patented nozzle throwing a continuous film of water *around* a rapidly rotating brush.

GARAGES
Saves extra help—one man does more satisfactory work than two or three men before. Makes you more profit or cuts your charges.

OWNERS
No need for rubber apron and old clothes; saves backache and temper—four-fifths of your time.

On Approval Send for descriptive folder or send $15.00, upon receipt of which, Wizard will be sent you subject to approval upon delivery. If not as represented, return at once and money will be refunded. Guaranteed against all mechanical imperfections.

THE CENTURY FOUNDRY CO., Inc.
1622 N. Salina St. Syracuse, N. Y.



Cutting Costs In Two With Troy Trailer

This wholesale grocer at Los Angeles formerly used two trucks for hauling goods to and from the freight houses. Now they use one truck and a Troy Trailer. The other truck is being used for city deliveries.

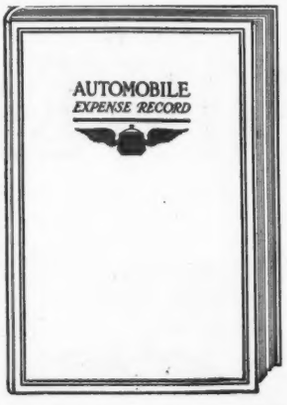
You can make your truck more productive, too. Investigate at least—get Bulletin M.

THE TROY WAGON WORKS CO.
Clay Street, Troy, Miami Co., Ohio

Is your car costing too much?

Is your tire mileage too low?

Do you wonder why so much gasoline is necessary?



Are your repair bills high?

Do you know what your gross cost per mile is?

Do you wish to run your car as you do your business?

THE AUTOMOBILE EXPENSE RECORD

solves all these problems quickly and accurately.

With the co-operation of the motorist this record classifies every item of expense—records the miles traveled—shows the mileage yielded by each gallon of fuel and oil and by each tire. It provides a ready means for determining whether gasoline is giving the proper mileage—whether tires are wearing abnormally and finally gives several pages of cost cutting recipes, any one of which should repay, one hundred fold, the cost of this little book and time spent in keeping it.

Do you know when you last used a decarbonizer? You frankly admit that your car may be ruined in a ten mile ride because of lack of lubrication, but how do you keep track of your lubricant? When did you last screw down your grease cups? When did you load up your transmission and differential with lubricant? Time flies—the memory is treacherous. It may seem to you that it was done a week ago when in reality it was a month or more. The AUTO EXPENSE RECORD provides pages on which these things may be carefully recorded that no lapse of memory may ruin your car or decrease its power to serve you well and inexpensively.

Keep a record of expense of every trip, in space reserved for this purpose.

Price $1.50 Postage prepaid

CLASS JOURNAL CO. 910 S. MICHIGAN AVENUE CHICAGO, ILLINOIS

(24)

Protect Your Health

Why wear goggles that heat your face, obstruct your vision, cause discomfort and afford **no** nose protection?

For only one dollar you can buy the Leasure Sanitary Eye and Nose Shield—the shield that is more than a **common goggle.**

A thin gauze under the nostrils keeps out dust, dirt and smoke. Doesn't interfere with breathing.

The Leasure *Sanitary Eye and Nose Shield*

Perfectly transparent. Gives wide range of vision. Cannot break or injure the eyes or face. No special **adjustment needed. Does not burden nose.**

ORDER TODAY. The Leasure Sanitary Eye and Nose Shield weighs only ½ ounce. Your choice of four colors: water-white, amber, blue or green. Send stamps, money order or dollar bill. Price includes elegant leather case. Please mention dealer's name.

DEALERS—Write us today for full particulars.

Sanitary Sales Co.
Inc.
Rm. 400 East End Trust Bldg., Pittsburgh, Pa.

SILK GAUZE KEEPS DUST OUT OF NOSE.

When You MUST Stop Your Car!

Every day you drive you face situations demanding that you stop your car quickly—and safely. Hence, you **must** rely on your brakes. You trust them with your life. They must work—the brake lining must be dependable always—until worn paper-thin. Such is

Thermoid HYDRAULIC COMPRESSED Brake Lining - 100%

Most of the foremost automobile makers equip with 100% Thermoid. They do their best to protect you. Do as much for yourself by demanding Thermoid always.

Some of the leading cars equipped with 100% Thermoid are: Peerless, American, Lozier, Locomobile, White, Marmon, National, Simplex, Oldsmobile, Stutz, Fiat, Apperson.

Our Guarantee: Thermoid will make good—or WE will.

THERMOID RUBBER COMPANY
Trenton, New Jersey, U. S. A.

SHIFT THIS LEVER FORGET THE WEATHER

The adjustment for varying speed and load is formed in the air and needle-valves of a

Motsinger Carburetor *increased mileage guaranteed*

They are cut from solid metal, and cannot change or vary. Temperature changes the adjustment of all carburetors. This ONE and ONLY adjustment for temperature on the steering-post enables the driver to keep a perfectly adjusted carburetor from January to September, without a change of needles, nozzles, or air-valves. Temperature is the foe of economy.

You are not interested in the economy obtained by experts on a three adjustment carburetor. Send for letters from our customers showing what you, YOURSELF, can get on your car.

Motsinger Device Mfg. Co.
885 Putnam Street **LAFAYETTE, IND.**

This Is the Catalog You Need

It contains Everything Electrical for the Automobile, Motorcycle and Motorboat. Send to our nearest house for a copy.

Western Electric Company

Manufacturers of the 8,000,000 "Bell" Telephones

New York	Atlanta	Chicago	Kansas City	San Francisco
Buffalo	Richmond	Milwaukee	Omaha	Oakland
Philadelphia	Savannah	Indianapolis	Oklahoma City	Los Angeles
Boston	New Orleans	Cleveland	Minneapolis	Seattle
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St. Louis	Dallas	Denver	Salt Lake City	

EQUIPMENT FOR EVERY ELECTRICAL NEED
Member Society for Electrical Development. "Do it Electrically"

HAWXHURST

HYDRO-OXYGEN

Auxiliary Carburetor

THREE DEVICES FOR
THE COST OF ONE

1st, a Decarbonizer
2nd, a Water-Carburetor
3rd, an Air Exhilarator

ALL-AUTOMATIC
FOR

25c

You may buy 1000 gallons of water. This is sufficient to **clean the carbon** from 3000 motors —when used through the "HAWXHURST," or run your car 1,000,000 miles and save from 25 to 50% in fuel bills. Prices from $6.00 to $15.00. Ford Special, $6.50.

All Devices Guaranteed or Money Refunded

HALLIWELL CO.

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Don't Accept a "Just As Good"

argument from the dealer; **always** insist on the genuine

LOOK FOR THIS MARK

It's your guide against substitution.

The V-Ray Spark Plug

shown is our "MIKA" type, core being composed of specially treated best white East India mica. All mineral deposits culled out. **The Flinting Process** renders it

Positively Impervious to Heat and Oil

Think what this means when used in an air-cooled motor!

Porcelain

$1.00

"MIKA" $1.25

All V-Ray Plugs are sold with a guarantee to give

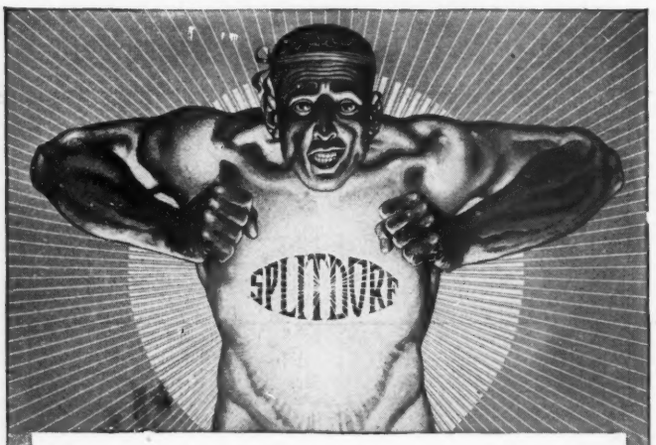
MORE POWER ON LESS GAS

For sale at all dealers and jobbers, who wish to serve you best.

All other 4 point plugs are imitations

All Dealers All Jobbers

The V-Ray Company
Marshalltown, Iowa



SPLITDORF MAGNETOS—low and high tension—are made in a wide range of models for all manner of work and they'll give your motor more power—make your motor run smoother and quieter than will any other make, and, equipped with one, you can always start your engine on a quarter turn.

We'll exchange your present magneto of any make on a liberal allowance basis for an up-to-the-minute SPLITDORF low or high tension.

SPLITDORF PLUGS are not experimental—they are standard. Known since their first appearance as the "common sense plug" they are exactly that—no more and no less. SPLITDORF PLUGS will outlast your motor—thousands are rarely removed from a cylinder head. There is nothing fanciful about them—they are made to endure any and every strain of ignition put upon them.

SPLITDORF ELECTRICAL CO.

98 Warren Street NEWARK, N. J.

Operating between Detroit and Buffalo

"Two GIANTS of the Great Lakes"

Str. City of Detroit III
Str. City of Cleveland III

The Delights of a Lake Trip

REST after work is necessary to human endurance, and holidays are a wise economy. The Great Lakes of America offer more vacation opportunities than any other source in the country. The steamers of the Detroit and Cleveland Navigation Company operating to all important ports are unrivalled in point of elegance, comfort and quality of service—the perfect freedom offered by the saloon and promenade decks, the commodious state rooms, luxurious furnishings and excellence of cuisine make life aboard these floating palaces a solace to the weary mind and body.

Where You Can Go

Daily service is operated between Detroit and Buffalo, Detroit and Cleveland; four trips weekly between Toledo, Detroit and Mackinac Island, the historic summer resort of the North Country; and from June 25 to Sept. 10 a special steamer, two trips weekly, will be in commission between Cleveland and Mackinac Island, stopping only at Detroit every trip. During July and August special daylight trips between Detroit and Cleveland. From June 10 to Sept. 10—daily service between Toledo and Put-In-Bay.

Railroad Tickets Available

Tickets reading via any rail line between Detroit and Buffalo, Detroit and Cleveland will be honored for transportation on D. & C. Line Steamers in either direction. Send 2 cent stamp for illustrated pamphlet and Great Lakes Map. Address L. G. Lewis, G. P. A., Detroit, Mich.

DETROIT & CLEVELAND NAVIGATION CO.

Philip H. McMillan, Pres. A. A. Schantz, Vice-Pres. and Gen. Mgr.
General Offices, Detroit, Mich.
Steamers arrive and depart from Third Avenue Wharf, Detroit.

"Gee! I'm Glad I Bought This Autowline"

SOONER or later you're going to experience real trouble if you drive without a Basline Autowline along. Punctures, blowouts, engine troubles, holes and ruts are incidents of the road, and when "something happens," you'll need a

Basline Autowline

"The Little Steel Rope With the Big Pull"

to get you home. Why not discount the inevitable? Get a Basline Autowline at once and be ready to tow or be towed. Basline Autowline is about 25 feet long, one-fourth inch in diameter and has hooks and slings for instant attaching. It is finest quality steel wire rope, same as world-famous Yellow Strand Powersteel, and, despite its small size, has enormous pulling power. Price east of Rocky Mountains, is $3.95. All accessory dealers have it.

FREE A fine illustrated circular telling all about Basline Autowline

Broderick & Bascom Rope Co.
813 North Second Street, St. Louis, Mo.
New York Office, 76 E. Warren St.
Manufacturers of famous Yellow Strand Powersteel Wire Rope that helped to build the Woolworth Building, New York.

Out of sight, under the hood! Just push a foot pedal--it goes! Price is right!--only $25

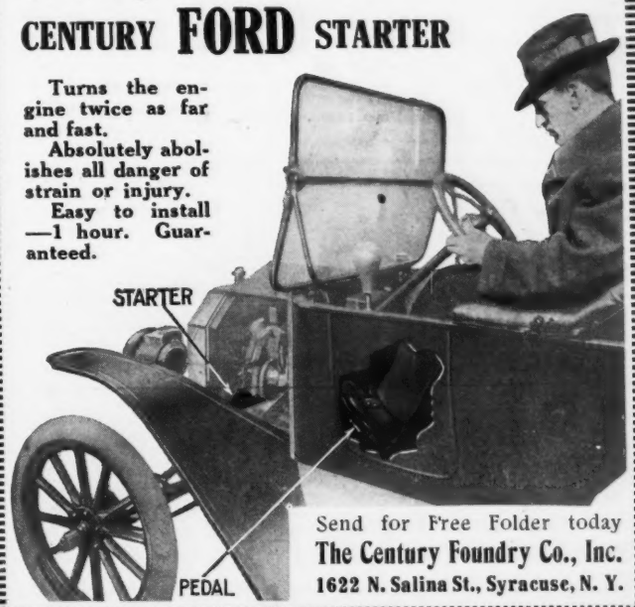
Complete your Ford with this powerful, simple, safe, sure Starter. Forget the danger of injury and the one great "kill-joy" of Ford-motoring. Everybody in the family can **now** start—easy, quick, sure and all done from the seat. Only $25 complete — convenience and safety considered, it's a bargain!

CENTURY FORD STARTER

Turns the engine twice as far and fast.

Absolutely abolishes all danger of strain or injury.

Easy to install —1 hour. Guaranteed.



Send for Free Folder today

The Century Foundry Co., Inc.
1622 N. Salina St., Syracuse, N. Y.

WESTON Model 301 Ammeters *for the* Cowl *or* Dashboard

are *specially built* with a full knowledge of the *exacting* requirements of automobile service. They are designed for continuous reliability and like all other Weston Models, are constructed with the most conscientious regard for the service for which they are intended.

Their serviceability, accuracy, and durability is vastly superior to that of any other small instrument and, in fact, their merits are so radical as to place them in a class which is distinctly their own. We should be glad to prove these statements upon request.

There is no better insurance for the automobile, or starting and lighting equipment manufacturers, against dissatisfied owners or expensive claims, than to use Weston Model 301.

It is an extremely high grade yet surprisingly inexpensive instrument.

For information address,

Weston Electrical Instrument Co., Newark, N. J.

New York, Chicago, Philadelphia, Boston, St. Louis, Denver, San Francisco, Detroit, Cleveland, Atlanta, Richmond, Toronto, Berlin and London

"WARNER GEARS—STANDARD FOR YEARS"

"It's an absolute impossibility to 'open up' a plant and immediately deliver efficient gear assemblies.

"It takes time and experience—especially experience—to enable a concern to ship really dependable parts.

"This is an undisputable fact, no matter what the business happens to be.

"We are surely capable, in lieu of these facts, as for thirteen years we have been manufacturing automobile gear parts for the most successful and best known motor car manufacturers in the country.

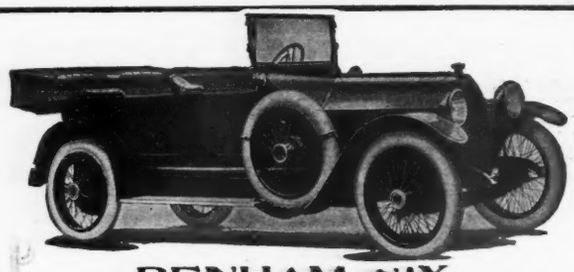
"And listen, what is more, we've been pleasing them in every particular.

"Is there any better proof of a product's merit than one hundred per cent of satisfied customers?

"Looks as if we ought to be able to please you too."

WARNER GEAR CO. MUNCIE-IND.

DETROIT OFFICE—628 FORD B'L'D'G.



BENHAM SIX

Continental 6 P motor, 48 H. P. Bosch Ignition. Brown-Lipe 4 speed forward transmission. Spicer Universal joints. Timken full floating rear axle. Timken front axle with Empico speedometer drive. Timken bearings throughout. Long radiator. One man top. Gemmer steering gear. Left drive, center control. Goodrich tires, 34 x 4½. Electric starting, generating and lighting. 130-inch wheelbase. 3,600 lbs.

Two pass., $2485; Five pass., $2485; Seven pass., $2535

BENHAM MFG. CO., Detroit, Mich.

THE ONE-MAN TOP

"IT NEEDS NO CRY FOR HELP"

Golde Patent Top

Complete Tops, Frames, Sockets and Shop Rights

Protected by 11 Patents and other Patents pending

CAN BE HANDLED BY ONE PERSON AS EASILY & QUICKLY AS AN UMBRELLA

INSTANTANEOUS PROTECTION

GOLDE-PATENT MANUFACTURING CO. 513 W. 56th ST. NEW YORK.

UNIVERSAL VULCANIZER

Tire Cuts Ruin Casings They admit moisture to the carcass, cause the fabric to rot and weaken, grow larger—end in blowouts. You can repair **casings** and **inner tubes** anywhere **in 15 minutes, good as a repair shop can do**—and for **one cent.**

A Practical Vulcanizing Outfit Complete, with enough repair gum to make thirty patches. Weighs 3 pounds, can be carried in tool box.

Price complete, **$3.50**

Ready for Instant Use. *At your dealers, or we will send it prepaid. Guaranteed satisfactory or money refunded.*

Patented April 2, 1912, April 1, 1913

ADAMSON MFG. CO., East Palestine, Ohio

THINK THOUSANDS OF MILES AHEAD, AND YOU WILL BUY

REPUBLIC MILEAGE

PLAIN AND STAGGARD TREAD

TIRES

THE REPUBLIC RUBBER CO.

YOUNGSTOWN, OHIO.

BRANCHES AND AGENCIES IN THE PRINCIPAL CITIES.

The Searchlight Gas Co.

1016 Karpen Building

CHICAGO, ILLINOIS

Stronger than ever, legally, financially and in the esteem of the trade. Watch us grow.

BRANCHES AND REFILLING STATIONS:

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Chicago, Ill.	Buffalo, N. Y.	New York City
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Camden, N. J.	Dallas, Tex.	Minneapolis, Minn.
Philadelphia, Pa.	San Antonio, Tex.	Toronto, Canada
Kansas City, Mo.	Boston, Mass.	Indianapolis, Ind.

Polarine

FRICTION REDUCING MOTOR OIL

Maintains the correct lubricating body at any motor speed or heat

STANDARD OIL COMPANY

(AN INDIANA CORPORATION)

THE RUTENBER MOTOR

MANUFACTURED SINCE 1901 FOR HIGH GRADE

AUTOMOBILES AND TRUCKS

8¾ x 5¼ four and six cyl.
4¼ x 5¼ four cylinder

Standard or Unit and

4 x 4 and 4¼ x 5¼ standard types, all L head, 4 cycle.

Manufacturers are invited to investigate our service and our facilities.

Literature on request.

The Rutenber Motor Company

Marion, Indiana

MARMON

"The Easiest Riding Car In The World"

Marmon "48"	Marmon "41"	Marmon "32"
Six Cylinders	Six Cylinders	Four Cylinders
$5000	$3250	$3000

Nordyke & Marmon Co.,
Indianapolis (Est 1851) Indiana

Over Sixty Years of Successful Manufacturing

HERZ PLUG

"BOUGIE MERCEDES"

20 YEARS OF SUCCESS

GUARANTEED ONE YEAR

HERZ PLUG, costing but a trifle more at first, costs a great deal less at last, *because it stands up.*

DEALERS—Handsome posters, showing the above figure in full colors, will be sent on request

HERZ & CO. 245 W. 55TH ST. (nr Bway) N. Y.

A Sure Light in the Stiffest Wind if You Use a

"PRESTO" CIGAR LIGHTER

No. 203

No. 202

Can be attached to the battery of any car. **No. 200,** Combination Cigar Lighter and Trouble Lamp. Price, **$3.50. No. 202,** Presto Cigar Lighter with Holder. Price, **$2.75. No. 203,** Presto De Luxe Cigar Lighter, complete with interchangeable cigar lighter tip and electric light bulb, and nickel-plated holder. Price, **$4.50.** With Pure Platinum Cigar Lighter Tips. **No. 204,** Presto Ford Watch Type Cigar Lighter for Ford cars. Price, with holder, **$2.50. No. 205,** Presto Star Watch Type Cigar Lighter for all other makes of cars. Price, with 6-volt lighter tip and holder, **$2.50. No. 240,** Automatic Cord Winder adaptable for use with any Presto device. Price, **$2.50.**

State battery voltage when ordering. Order through your Dealer or Jobber.

No. 200

No. 240

No. 206

METAL SPECIALTIES MFG. CO.
736-38 W. Monroe Street
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Eastern Office
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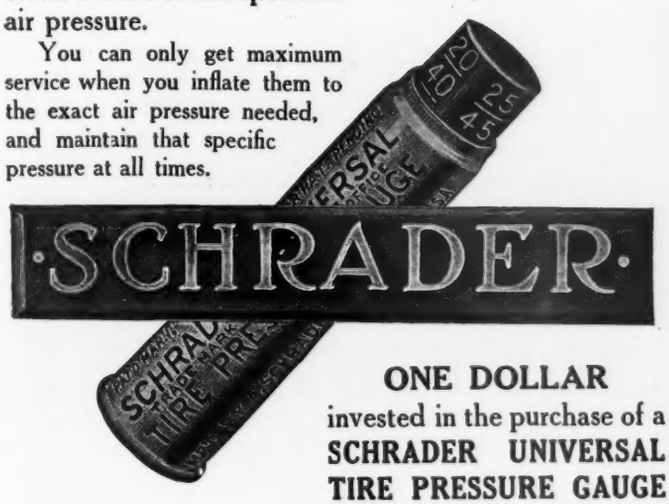
You cannot run your car with any old air pressure in the tires *and expect the tires to last.*

Tires are built to withstand a definite and specified air pressure.

You can only get maximum service when you inflate them to the exact air pressure needed, and maintain that specific pressure at all times.



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invested in the purchase of a **SCHRADER UNIVERSAL TIRE PRESSURE GAUGE** will save you hundreds of dollars for new tires.

For Sale by Tire Mfgrs., Jobbers, Dealers, Garages or

A. SCHRADER'S SON, Inc.
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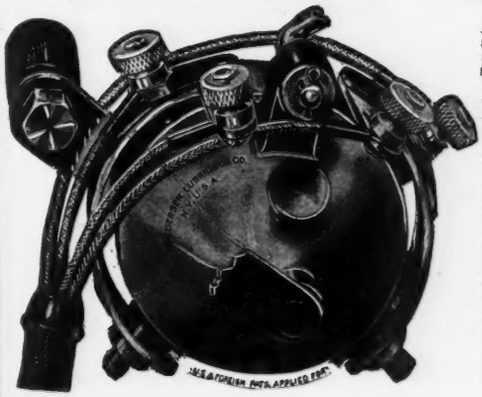
Pedersen "United" Terminals



A convenience and trouble saver which should be used on the timer of every FORD Car.

This very practical device is made of two stamped brass pieces, provided with insulation fibre, easily attached to timer and bringing all the terminals on top of the timer. This prevents them becoming oil soaked with consequent short-circuiting, also twisting and straining at their connections.

Price 50c by mail postpaid

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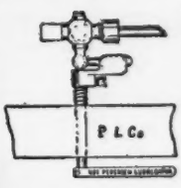
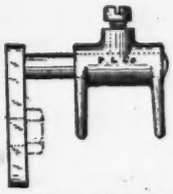


PEDERSEN HANDY GASOLINE TURN-OFF 75c



THE "STAY-ON" BELT HOLDER 50c

Install a Pedersen Lubricator on your car and make it last for years. It saves you money, trouble and worry *Ask your dealer or write*

PRICE, $15.00

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In Design 'Tis the Newest
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LARGE PRODUCTION IN DETROIT

Now Every Motorist Can Have

A MASTER

QUICK ACTION

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HAM'S

OIL POT INSIDE

STEEL MOTOR TRUCK LAMPS

C. T. HAM MFG. COMPANY
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TIRE PUMPS

Are easy to use and easy to sell. They are durable and efficient—and are widely advertised. The cylinders are of seamless brass tubing which cannot rust. The "Stapley," the "Aeolus," "Windjammer," etc., gives lasting satisfaction. Carry them in stock.

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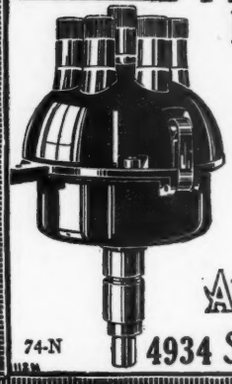

The Atwater Kent Ignition System

For every kind and make of motor. A system ideal in efficiency, simplicity, and reliability.

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See our announcement this publication July 16th Issue

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Large Bearings Long Stroke 4 and 6 Cylinder

Our leaders
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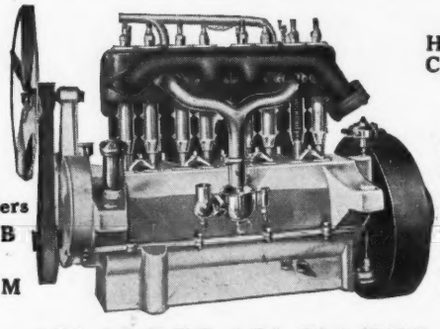

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4 Cyl., 5x5, 40 H. P., 4 Cyl., 4½x5, 35 H. P.

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NO MORE SIDE-WALL BREAKS — RIM-CUTS — PINCHED TUBE — BLOW-OFFS

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BIG VALUE FOR LITTLE MONEY

This little pump is made of grey iron bored and reamed. Can't get out of order. Won't overheat and stick in the cylinder. Always works. Pumps pure cool air. Saves your time, temper and tires. Wears forever. Nothing like it at anywhere near the price. Find out all about it. Your dealer or your neighbor knows; if not, ask us.

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Comfort and Safety

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can improve an almost perfect car by attaching

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Aluminum Heel Plates

to the rubber mat where heels rest when feet are on pedals, and you'll never need a new mat. No screws or rivets necessary. Simply bend corners down, place on mat, mark position on corner, cut slits in matting, insert corners and bend to clinch. Attached in 5 minutes and last forever.

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ADJUSTABLE TO ANY LOAD

the shock absorbers that have made good on heavy and light cars alike. The adjustment feature found only on Coxajustos is the reason for their superiority. A simple twist of the wrist adjusts them to the load. There is a model especially for the Ford.

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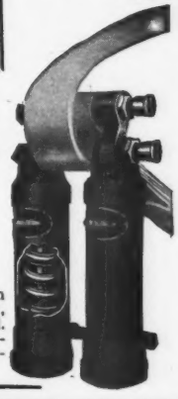
1777 Broadway, New York City. 2637 Michigan Ave., Chicago, Ill. 870 Woodward Ave., Detroit, Mich. 1216 Van Ness Ave., San Francisco, Cal. 899 Boylston St., Boston, Mass. Export Representative, Auto Supplies Export Co., 1779 Broadway, New York City.



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Brictson Pneumatic Tires

We now sell Brictson Pneumatic Tires on a specific guarantee of 10,000 miles service. *Brictson Pneumatic Tires* are Puncture-proof, Blowout-proof, Skid-proof, Rut-proof, Rim cut-proof, Oil-proof and Gasoline-proof. A tire with wonderful resiliency and easy riding qualities.

Ten Days Free Trial—To remove any possible doubt concerning the merits of Brictson Tires and to back up our statements fully, we will allow you ten days' trial on these tires at our risk. If Brictson Tires are not perfectly satisfactory in every way you can return them to us at any time within ten days and we will cheerfully refund the entire purchase price. Send for particulars today.

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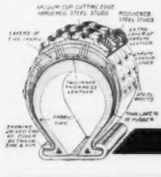

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Set the Standard

The Winton Six (not any other car) made six cylinders standard and forced four-cylinder cars from the high-grade market. Supreme excellence did it, and you will find that supreme excellence in the Winton Six.

The Winton Six holds the world's lowest repair expense record—25.1 cents per 1000 miles. No other car holds that record, or anything like it. If you want this sort of enduring goodness, look for it in the Winton Six.

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Four floating bronze ball valves opening automatically under different motor suctions supply a uniform mixture at any speed, regardless of hot, cold, wet or dry weather.

Write for details and let us tell you why so many manufacturers are adopting this carburetor as standard equipment

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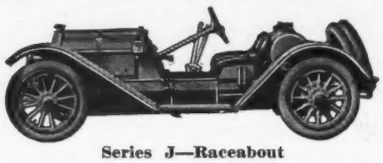
AMERICA'S FIRST GRAND PRIZE WINNER



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The remarkable endurance of Mercer raceabouts is not accidental. It is the result of conscientious attention to even the slightest detail of manufacture.

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You can take a thousand miles of service out of a set of tires by driving them insufficiently inflated over ten miles of road.

Use the New Positive Lock Stop

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For sale by Jobbers, Dealers, Garages, or

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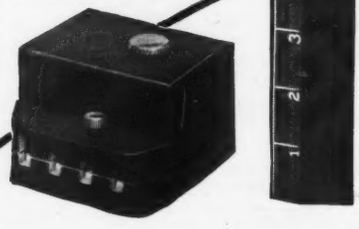
Your Lighting System

regardless of its name will be benefited by the use of a

WARD LEONARD Controller

This small automatic dynamo controller also contains the automatic switch that connects to and disconnects from the battery. This controller will operate sparklessly with any low voltage automobile dynamo and maintain a constant predetermined dynamo output. Complete data upon request.



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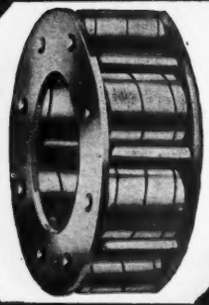

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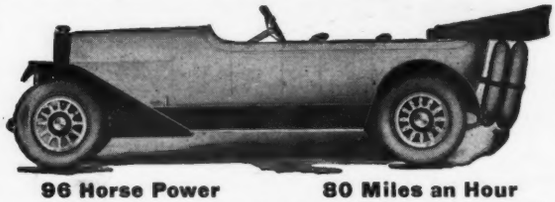
THE RICHARD



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2000 lb. REPUBLIC TRUCK WITH EXPRESS BODY

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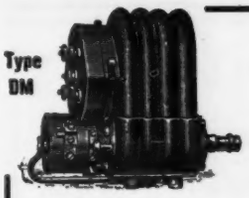

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The performance of **HEINZE IGNITION APPARATUS** for the past ten years justifies our claim that our product is superior in both points of construction and efficiency.

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"32" Touring Car, fully equipped	$1050
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All prices F. O. B. Detroit

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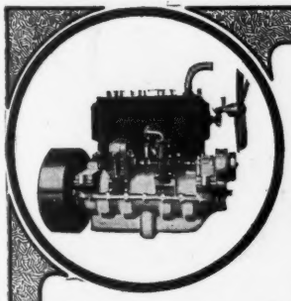

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Not made to meet a price, nor to shatter records of quantity, but to fulfill a service ideal—to be a true foundation for a worthy motor vehicle.

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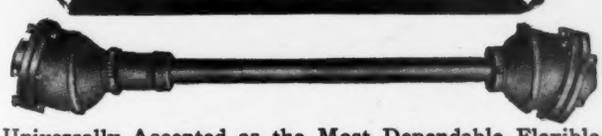

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1914 is to be the year of the Light Car—the low upkeep car—the VULCAN.
Send for catalog and generous dealers' proposition.
VULCAN MFG. CO., Painesville, Ohio **Lock Box MA477**

The Detroiter — A Complete Line $850 to $1050

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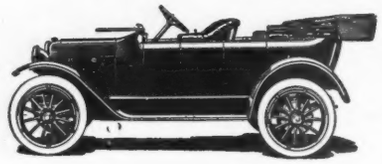

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Enclosed Valves, Three Point Suspension, Unit Power Plant, Platform Rear Springs, Full Floating Rear Axle, Left Hand Drive, Center Control, Drop Frame, Large Tires, Complete Ball Bearing Car.

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We Guarantee the Quality
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IT WILL PAY YOU TO WATCH OUR ADS.

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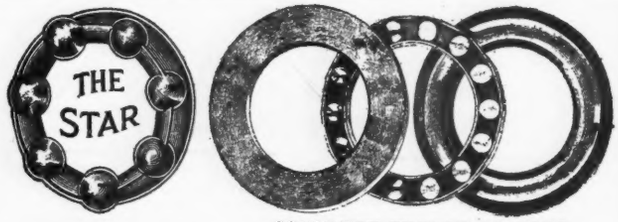

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RADIAL RETAINERS

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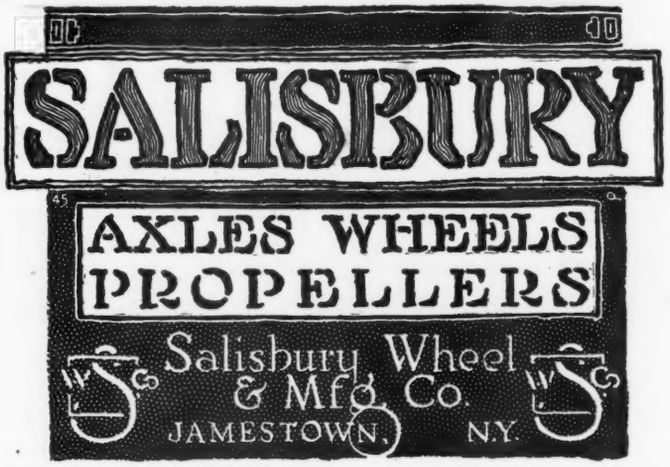
Manufacturers of Radial Ball Retainers, Thrust Ball Retainers, Complete Thrust Bearings



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By this system, exclusively our own, you gain 22.8 per cent more power with the same amount of fuel. Great economy and more power when you want it. No back pressures in the exhaust manifold. The clean incoming gas is undiluted.

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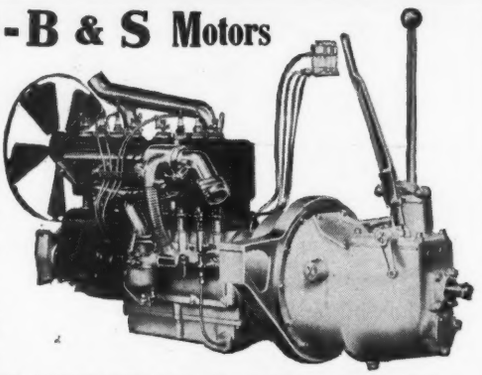
Motors G-B & S Motors

We beg to announce our latest four cylinder Unit Power Plant.

This Motor includes the recognized engineering practice, here and abroad.

"Craftsmanship of long experience is the result of this distinctive Power Plant."

Detailed information on request, and we are in a position to make prompt deliveries according to contract.



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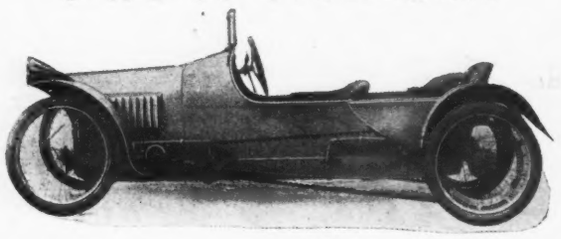

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Two passenger roadster, equipped with electric lights, glass windshield, electric horn, pump, set of tools and repair outfit.

PRICE $385

Full panel delivery model—Price $405.
Write for catalog and selling plan.

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They are equipped with the

LEECE - NEVILLE

STARTING and LIGHTING SYSTEM

No traveling physicians are required to keep this system in good service condition

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GEARLESS TRANSMISSION

Cartercar

Big Model 5-A

SIMPLE—STAUNCH—TRUE

A Car Full of Hill Climbing Ability

Interesting Facts About the Gearless Transmission Sent Free—*Write for them.*

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Model "36" $1275.00

A car whose design and construction is so far ahead of others at its price that it is in a class all its own.

Gray and Davis Electric starting and lighting equipment, silent chain cam shaft drive, four inch by five inch motor, cork insert multiple disc clutch, 116 inch wheel base, left side drive, center control, and equipment complete to the last detail.

Model "25" $975.00

Including Electric Starting and Lighting System

This model has made the Paige reputation. Such a sturdy, powerful, comfortable car has never been offered the public at anywhere near its price. $975.00 with complete equipment.

Splendid Agency Proposition

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Dayton Airless Tires

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When you order Dayton Airless Tires give the exact weight of car or the make and model.

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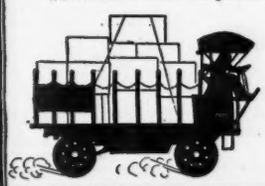

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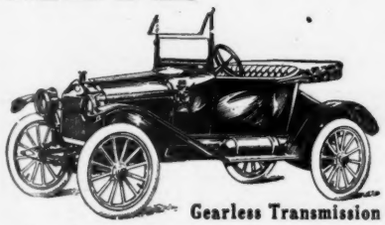

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Second edition. A manual on care, repair and operation. Makes you master and mechanic of Ford Model T. Details dismantling and assembling of its mechanical parts. Troubles located and readily remedied by digest index. Circular on request, or sent postpaid, $1.00.
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Generator and Burner and several other good parts cheap.
Address BOX E 20, Care Motor Age

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Rear Axles with 3 speed transmission, complete with hubs, hub caps, bearings, 36x4½ wheels with demountable rims, torsion tube, drive shaft, universal joint, complete, $150.00.
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Air Drying, Glossy Refinisher and Color Finishes—all colors. Write us condition of your car.
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PRICES RIGHT
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Extraordinary Price Inducements

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This company has been reorganized under new management and with new capital. We are moving our plant to Indianapolis, Indiana. Our policy will be to furnish prompt, first class service for all repair parts to Herreshoff cars. For immediate attention to orders for repair parts write direct to our new factory, South Meridian Street and Belt R Ry., Indianapolis, Indiana.

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Save $25 to $75 by doing the work at home with the Arsenal system. Our big free booklet, "The Car Beautiful," tells how. Send for it today.

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We have a large stock of parts for Chalmers, Carter Cars and Ramblers which we will sell for half price.

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WRIGHT-HAS-IN-STOCK

Complete new radiators for all standard models. Replacement our specialty. Delivery on receipt of order.

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To change from A-C circuit 1 to 8 ignition, lighting or starting batteries at one time; $12 and upwards. **AMERICAN BATTERY CO., 1124 Fulton St., Chicago.**

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We repair any broken Flexible Shaft Casing or Housing, Swivel Joints and all Speedometer Parts. Fibre Pinions, all sizes, 50c and 75c. All goods shipped same day received.
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Speedometers Speedometers

Special prices to Ford owners for all makes of Speedometers and Parts.

GENERAL SPEEDOMETER REPAIR COMPANY
53 West 63rd St. New York City

"STOP THIEF"

Patented lock for Ford and other small cars. Impossible to start motor. Two keys with each lock. Sent prepaid, $1.50. May save price of your car. **MARSHALL, WALTER & CO., Milwaukee, Wisconsin.**

That Mysterious Rag Duster

For dusting and polishing automobile bodies, windshields, lamps, pianos or any other polished surface. House Size 25c. Automobile Size 50c. Sent to any address upon receipt of price. If not satisfied, return duster and we will refund purchase price.

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1036 So. Main Street, Waterbury, Conn.

TOOL KITS

Special Sale of Complete Tool Kits
Why pay $5.00 when you can get a standard kit complete for $1.09?

PURITAN MACHINE CO.
Detroit, Mich.
ALL PARTS ALL CARS

REDUCE

High Cost of Running Your Automobile by Buying Supplies at less than Manufacturers' Prices

From the Original "Price Wreckers" and

World's Largest Dealers

Following is a list of a few of our especially good values. It is not a complete list of our stock. Do not hesitate to call on us if you are in the market for anything not listed.

Schebler carburetors, 1¼" model "D" & "L"	$ 7.00
Holley carburetors	2.50
Rayfield carburetors	6.50
Kingston carburetors, $2.50 to	4.00
Side oil lamps, per pair	2.75
Electric headlights, regularly $25; our price, per pair	8.00
4 & 6 cylinder Gianoli imported magnetos, high tension, regularly $100 to $150; our price, $15 and	20.00
Bosch low tension magnetos	3.00
Remy magnetos, model "S"	9.00
Splitdorf dual outfits, complete	25.00
Magneto coils, $4 up; 4 & 6 cylinder Connecticut coils	12.00
Storage batteries	8.00 up
Steering columns, complete with wheel	13.50
Steering wheels, $2.50 to	3.50
Stewart-Warner and Jones Speedometers	12.00
Velvet Shock Absorbers	10.00
Mondex Shock Absorbers, per set of 4.	12.00
$40 Disco starters	5.00
Open and closed Ford delivery bodies, $25 and	50.00
Racing seats, regularly $50 per pair. Our price, each	15.00
1914 Ford runabout bodies	40.00
Roadster bodies, $30 each; Peerless 7 pass. bodies	35.00
5 pass. fore-door bodies, $85; fenders, all sizes	1.50 up
Axles, complete, front and rear	40.00 up
Ford radiators, new	17.00
Radiators—Cadillac, Pierce, Knox, Stevens-Duryea, Fiat, Warren, Olds, and a hundred others, $17 to	35.00
Ball bearings, all sizes, less than one-third.	
Tops, runabout and touring	5.00 up
Round gasoline tanks	6.00
Square gasoline tanks	2.50
Lavaigne oilers, $5 to	7.50
Presto tanks, complete	13.50
Continental rims, 36x4—4½	3.00
Dorian rims, all sizes, $2.50 and	3.00
Universal joints	5.00
Ford oilers	.05
Rear tire holders, 1 or 2 tires	1.75
Tool boxes, all sizes, $1 up. Jacks	.65 up
Electric horns, complete	1.95
$25 trunks	5.00
Tire covers, .75 to $1. Tool kits	1.25 up
Goggles, .20 up. $25 windshields	12.00
Mohair dusters, $3.50. Chauffeur's dusters	1.00
Storm fronts and side curtains	1.00
Appelco lighting system, complete	32.50
Brown Lipe Transmissions	50.00
Top covers, $2.50. Tire gauges	$ .35
Reliners, all sizes	1.75
Single, double and triple action pumps,	75c up.

A-1 tires and tubes—

30x3	casing..$ 6.65	Grey tube	$2.35
30x3½	casing.. 9.55	Grey tube	2.95
32x3½	casing.. 9.65	Grey tube	3.20
34x4	casing.. 14.65	Grey tube	4.10
36x4	casing.. 14.85	Grey tube	4.40

Truck tires, all sizes.....$12 to $25 each
Springs, all sizes, at less than factory prices.
Motor driven electric horns.....$7.50

We also have such goods as Klaxon horns, Weed chains, Spitfire sootless spark plugs, and in fact everything for the automobile. Consult us before buying anything in the way of automobiles or supplies and send for our free PRICE WRECKER.

Times Square Automobile Co.

S. W. Cor. 56th St. and Broadway, N. Y.
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Tops Built, Recovered and Repaired

Also top covers, radiator covers, luggage cases, celluloid, etc.

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TRAVELING SALESMEN

Side line—Our Fibre gears for speedometers sell to all garages.

D. OGDEN, Columbus, Ind.

Vulcanizers slightly used, as good as new, for shop use. A great bargain.

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Springfield Ohio

WE GOT THE F. A. L. AUTO COMPANY

Bought at Auction for Cash.

All service stock, patterns, jigs, tools, dies, blue prints, good will, etc. Everything from the smallest bolt to parts for a complete car.

Will Sell Direct to You

LOOK!

Batteries for lighting	$ 5.50
Frames	5.00
Side lamps	1.75
Tail lamps	1.50
Electric head lamps, pair	6.25
Wheels—all sizes	3.00
Bodies	18.00
Front axles	10.00
Weston-Mott rear axles	40.00
Spark plugs	.19
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Windshields	8.19
Transmissions	40.00
Hartford Shock Absorbers (set)	20.00
Rayfield and Fletcher carburetors	5.19
Kingston carburetors	3.95
2-in. Raybestos brake bands	1.25
Mufflers	1.50
Model H High Tension K. W. magnetos	18.50
Atwater Kent Systems	18.50
Springs	3.00
Electric Horns	2.49

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Puritan Machine Company,
Detroit, Mich.
All Parts—All Cars

We Make Ford Racing Type Bodies

In several models for immediate delivery

AUTO SHEET METAL WORKS
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WELDING PLANTS

No. 1—Without tanks	$36.00
No. 2—With acetylene tank	52.00
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TERMS

No. 1—Cash with order	16.00
No. 2—Cash with order	32.00
No. 3—Cash with order	37.00
No. 4—Cash with order	41.00

Balance $5.00 per month, contract, or for all cash deduct 5 per cent. Address Dept. R.

AUTO WELDING AND MFG. CO.,
Omaha, Nebr.

YOU CAN CHANGE YOUR CAR
into raceabout yourself. We furnish radiators, hoods, seats, tanks and fenders. Get our prices.
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10,000 Miles Without Punctures

10,000 miles without punctures or slow leaks, and doubled mileage. Porous tubes repaired in five minutes with "Sin-TI" Puncture Fluid, the practical puncture eliminator. All at small cost of 50c per 3 or 3½ inch tube, 75c per 4 or 4½, $1 per 5 or 5½. Satisfaction or money back. Literature upon request.

SIN-TI TIRE CO. Washington, D. C.

$100 is the Cost of the Acme Cylinder

Grinder, an attachment for a lathe that will grind automobile cylinders round and straight. Particulars on request.
ACME GRINDER CO.,
2740 Humboldt Ave., So., Minneapolis, Minn.

The Clearing House—continued

We Tear 'Em Up and Sell the Pieces

We want old autos, condition no object. We will buy anything for the auto. We have all kinds of parts, many of them new, at unheard of low prices. Tires and tubes, many new, others used. Kingston carburetors, all sizes; will exchange for others. Gears of all kinds, new gas oval tanks, new timers, magnetos, coil. Stewart speedometers, shafts and chains, tire covers, dust hoods, electric horns, new brass bumpers, lamps, all kinds; Prest-O-Lite tanks, oilers, cylinders, pistons, transmissions, crankshafts, seats and bodies; new 30x3½ wheels, many other used sizes; rims; several chassis without engines; 2-cylinder, 4-cylinder, 6-cylinder engines; springs; in fact, everything that an auto needs. Correspondence solicited. If we do not have it, will advise you where you can get it. FOLLOWING MOTORS NOW IN STOCK PRICED FOR QUICK SALE:

4-cyl. Jackson engine model 38	$100.00
4-cyl. Stoddard Dayton engine, model D 35 h.p.	75.00
4-cyl. Stoddard Dayton engine, model F, with magneto	100.00
4-cyl. Stevens Duryea engine, model R 24 h.p.	90.00
6-cyl. Standard engine, 75 h.p., Bosch magneto	175.00
4-cyl Ford engine, Model B, 20 h.p.	50.00
4-cyl. King 1913 engine, 30 h.p.	100.00
4-cyl. Wayne engine, 35 h.p.	75.00
4-cyl. Pope Toledo engine, 50 h.p.	75.00
2-cyl. Rambler engine, 20 h.p.	30.00
4-cyl. model N Ford engine, complete, 15 h. p.	50.00

Can furnish any ignition system for motors at small additional figure.

Will sell any part of these or other motors.

New fresh stock storage batteries, 6-60	6.00
New 1914 Garford foredoor body, fenders and running board	100.00

OUR GUARANTEE TO ALL—IF NOT SATISFIED WITH YOUR BARGAIN, RETURN AND WE WILL REFUND YOUR MONEY.

AUTO WRECKING CO.
Old Church, 13th and Oak
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SAFETY—
"KLEAR VIEU"
CLEANLINESS—
WONDER-MIST
CONVENIENCE—
"ELK TERMINAL"

WRITE FOR OUR CIRCULAR

JOHN B. STAM & CO.,
DISTRIBUTORS
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We will pay cash for your extra Prest-O-Lite tanks.
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My aim is to honestly advise and faithfully serve my clients. Incorporation papers prepared.
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PRIVATE GARAGES

Galvanized steel or wooden. The finest line offered. If interested write.
Garage Factory, Beaver Springs, Pa.

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A. A. A. Radiators Manufactured
Any make repaired and returned same day. Radiator to fit any car shipped in 3 days.
SHEPPARD CO., 1331 Jackson Blvd., Chicago

Before ordering elsewhere, get our prices on new radiators, hoods, fenders, tanks and for installing new cores in old or damaged radiators. Radiator repairing our specialty.
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CHICAGO MFG. CO.

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We are the only radiator manufacturers in Chicago making a square tube radiator. New guaranteed cores placed in old radiators. We also manufacture Hoods, Fenders, Tanks and Pans and do guaranteed repair work. Prompt service.

ONLY RADIATOR FACTORY IN NORTHWEST

Pioneer manufacturer. Why send your radiator down east when you can ship it to us; save time, express, freight, money, and get best workmanship. Prices right. Make new radiators; allow for old one.

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820-824 Mary Pl. Minneapolis, Minn.

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AUTO SPRINGS REPAIR CO.

We manufacture and repair springs. Proper action compound put in springs.
1331 Jackson Boulevard, Chicago, Ill.

A NEW MOTOR

made out of your old one; we will rebore and grind your cylinders and make new pistons and new rings, the whole operation to be up-to-date factory methods; write or 'phone for price on your car.

STARBUCK AUTOMOBILE CO.
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General machine work for foreign and American cars. Welding all kinds of metal. Everready Automatic Engine Starter Sales and Service.
Carbon removed with oxygen
Manufacturer Catelain Hose Coupling
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OXY-ACETYLENE
WELDING GEARS
and Parts of Every Description
ADAPT MACHINERY CO.
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CYLINDER REBORED

Including piston and rings.....$7 to $11
STERLING ENGINE CO.
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CYLINDERS REBORED AND REGROUND

Fitted With My Light Cast Iron Pistons

40% to 100% lighter than standard, and with my new rings, makes a four run like a six, with a guaranteed gain in efficiency of from 25% to 50%

McCADDEN MACHINE WORKS
ST. CLOUD, MINN.

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We have special equipment for regrinding cylinders, fitting new pistons and rings. Prices, $7 to $15 per cylinder.
Autogenous Welding
Magneto and Battery Work
Prompt Service
BERNHARD & TURNER AUTO CO.
Des Moines, Iowa

CYLINDERS REGROUND

and fitted with new pistons and rings for $7 to $11 per cylinder. We do this class of work exclusively and are thus able to give you the highest class of work at these prices.
CROWN MACHINE SHOP
Crown Point, Ind.

FORD
Cylinder Grinding
New Pistons, Rings, Pins

Our special equipment for grinding Ford Model T cylinders enables us to fit new pistons, new rings, and piston pins on short notice. A complete job better than new at prices that will interest Ford dealers as well as owners.

Write at once to

AUTO ENGINE WORKS
St. Paul, Minn.

SCHOOLS

AAAA—COME TO DETROIT, the "Automobile Center," and learn the business in the largest and best equipped school in the country. **MICHIGAN STATE AUTO SCHOOL, 11-19 Selden St., Detroit.** "The Old Reliable School."

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"How to Succeed in the Automobile Business," on application. A Greer diploma guarantees efficiency. Largest motor college in the world—1,400 graduates—$40,000 in modern equipment—eight instructors—actual work, repairing and driving—Day and evening classes—many owners and dealers employ Greer graduates only.
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On every make, driving on dozens of cars, starting and lighting with largest equipment in America; steam vulcanizing, oxy-acetylene welding and everything known to this business. A $20 to $50 course brings you $1,000 to $2,500 a year.
Academy of Automobile Engineering,
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The Clearing House—continued

TIRES

A1 GUARANTEED TIRES

What make do you use? What size?
WRITE FOR OUR PRICE BULLETINS
We pay express charges.
ALLEN S. SINSHEIMER
1503 Michigan Ave. Chicago, Ill.

Auto Tires Recovered as Follows

30 x 3	$5.80	32 x 3½	$7.80
30 x 3½	7.20	34 x 4	9.65
36 x 4½	$12.00		

Non-Skid Treads applied from $1.00 to $3.00 extra. Workmanship and material guaranteed. A trial will convince. Repairing tires since 1896.

JUNGKIND & VOGLER
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Branch 1100 Bedford Avenue, Brooklyn, N. Y.

AUTO TIRES 3500 MILES

Guaranteed, 40% to 65% Off.

All standard makes. We will better any price on same quality. Get our prices before buying. Save the dealers profit. We buy and sell new and used cars. Send for accessory catalogue.

AUTO ECONOMY CO.,
1686 Broadway New York

Bargains in New Tires

We can save you 40% on any size.
Send for our price list.

SERLIN TIRE CO.
1073 14th Place Chicago, Ill.

I'LL SAVE YOU MONEY

ON TIRES! Dollars saved on every size Signed guarantee of 3,500 miles with every tire. I'll show you how to make dollars on your old tires, too. Don't buy another tire until you get my illustrated price list. Write me today. It will pay you. State size. J. A. McMANUS, Manager.

PEERLESS TIRE COMPANY,
304T 54th St., West, New York City

Make Two Old Tires

Do the work of a new one. Send us two of your old casings, regardless of their condition, by our process we return you the two tires made into one ready for 2000 miles of actual service. We guarantee this mileage absolutely. We are doing it for others. Send us two old tires today, or write and ASK US HOW.

COWANS BROS.
150 W. 55th St., New York City

TIRES

Twenty-two years in the rubber business. It is the reputation that counts. Expert tire repairing. The best equipped shop in New York. Manufacturers for U. S. and Canada for the famous Samson Tread. Distributers for all standard makes. Get our prices before buying.

H. PHILLIPS RUBBER WORKS
1989 Broadway, N. Y.

TIRES! TIRES!

FRESH STOCK

	New	Used		New	Used
30x3	$ 7.25	$5.50	34x4	$15.50	$10.00
30x3½	10.10	7.00	36x4	16.25	10.50
32x3½	10.90	8.00	36x4½	20.25	11.50

All other sizes in proportion. Bargains in new and used tubes.

ACME TIRE & REPAIR CO.,
Phone Calumet 3127
1547 Michigan Ave., Chicago

SPECIAL PURCHASE!

1,000 grey inner tubes. New stock, not old or patched. All sizes from 28-3 to 37-5, $1.25 while they last.

TIRE SALES CO., 931 Main St., Buffalo, N. Y.

TIRES TIRES TIRES

SEND FOR OUR NEW CO-OPERATIVE PLAN Our plan shows YOU how to get YOUR tires and tubes.

FREE OF CHARGE!!!

3500-Mile PRINTED GUARANTEE of actual service with every tire. Send for YOUR copy. State size you use. Write now—RIGHT NOW.

TUXEDO AUTO TIRE EXCHANGE
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Absolutely Guaranteed Welding

We absolutely guarantee all work done by the OXWELD PROCESS of welding and cutting, including welding cracked or defective cylinders, crankshafts, housings, aluminum crank and transmission cases, etc., etc. Estimates furnished on job and contract welding and cutting of all kinds.

OXWELD ACETYLENE COMPANY
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Advance Welding Machine Co.

Welding of all kinds of metals. Cast iron and aluminum a specialty.
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Phones: Monroe 3337; Auto 36-192. Chicago, Ill.

Almost any metal broken you can have made good as new by a

"VULCAN"

Oxy-Acetylene Welding and Cutting Plant. Not the cheapest, but most efficient known. Highest grade apparatus with special patented features.

$100.00 and Upwards

Write today for book "A" on welding.

VULCAN PROCESS COMPANY
Minneapolis, Minn. Cincinnati, Ohio

AMERICAN WELDING CO.

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Autogenous welding of all metals, such as crank cases, cylinders, etc. We positively guarantee all work. Tel. Calumet 3563.

Autogenous Welding

Expert welders on automobile parts. Manufacturer of reliable welding plants. Get our price and description of welding plant and carbon removing outfit for repair shops and garages.

C. SORENSEN
18 East 16th Street Chicago, Ill.

WELDING

Cylinder, crankcase and crankshaft welded. Cylinders rebored, $7 to $11 a cylinder, including piston, 8 rings.

STERLING ENGINE COMPANY
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WANTED---AGENTS & SALESMEN

A1 Salesmen wanted to sell M-E OXYGEN GENERATOR, latest device for cleaning carbon from auto cylinders and do Oxygen Acetylene Welding, generating your own Oxygen. Price low, Big seller. Good profits. **Fisher, Richards & Todd, Hazleton, Pa.**

Read Motor Age

English motor company with London showroom wants sole English agency of American car and accessories. Terms and particulars to

HEATHER, 119 Hoe St., Walthamstow, London

NO MORE BLOW-OUTS NO MORE PUNCTURES

Interlock Inner Tires make your tires twice as strong—give double mileage—prevent punctures, blow-outs and rim cuts. Makes old tires strong as new. Write for booklet today. Splendid opportunity for live dealers and agents. Write us for proposition.

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128 West 11th St., Auburn, Indiana

Exclusive and Side Line Salesmen

for spark plugs and accessories. Well established. Good chance for right man.

STURDY MFG. CO.
2637 Michigan Ave. **Chicago**

MISCELLANEOUS

We Are Constantly in Touch

with employers requiring High-Grade Engineering service. Are you listed with the

TOLEDO ENGINEERING AGENCY
Toledo, Ohio.

DID YOU NOTICE

what cars equipped with

MAGNALIUM PISTONS

did in the July 4th races?

I make a specialty of reboring and regrinding cylinders, fitting old engines with MAGNALIUM Pistons (70% lighter than iron). I equip old engines with new and modern accessories such as starting and lighting systems.

I have more than 4,000 square feet of floor space and nearly $10,000 worth of tools and equipment that will be devoted to this work and can give you quick action and the best results possible.

Have Your Motor Rebuilt

in a factory that is properly equipped to handle such work accurately and efficiently and is operated by men of wide experience.

After several months of preparation I now have my shop in shape to handle all kinds of gasoline and kerosene engine repair and rebuilding work in an accurate and workmanlike manner and solicit such work.

LEE W. OLDFIELD
526-30 S. Fifth St., Minneapolis, Minn.

The Clearing House—continued

Advertisement for Bids for Furnishing Motor Vehicle Tags for 1915 Registration

Notice is hereby given that proposals for furnishing to the State of North Dakota twenty thousand (20,000) automobile tags with duplicates and two thousand (2,000) motorcycle tags with duplicates—with such additional tags and duplicates as may be required during the year 1915—will be received at the office of Thomas Hall, Secretary of State, at the Capitol, in the City of Bismarck, North Dakota, until two o'clock, p. m., on the 1st day of August, 1914.

Tags must conform in size and form with the provisions of Section 10, Chapter 6, Session Laws of 1911.

Numerals and letters are to be as provided by law, to be so spaced as to give a good general appearance and as may be more specifically designated in contract or as shown by sketch.

Each automobile tag shall be furnished with a 3/16-inch round hole at each corner and also slots near the margin of the plate, top and bottom, just inside of each corner hole, or four holes and four slots to each plate. It is to be preferred that these slots are to be so constructed or protected to prevent cutting or injuring the hangar straps. Tags must be rounded at the corners. The tags shall be made of black charcoal or Bessemer steel of not heavier than 20 gauge or lighter than 30 gauge, with the necessary figures and letters enameled or embossed, or both, on same. The tags must be so crimped or designed as to provide sufficient rigidity and durability.

There shall be a marked contrast between the color of the plates and the color of the letters and figures thereon; such colors to be designated by the Secretary of State.

Tags are to be packed in heavy envelopes ready for mailing. Two plates of the same number are to be in each envelope with proper packing, to prevent damage in shipment to final destination, and also to be packed as lightly as is consistent with safety in order to save postage and express.

The envelope is to bear the following printed return cards: "From Thomas Hall, Secretary of State, Bismarck, North Dakota," and, "Postmaster: If not delivered in five days notifiy this department for return postage, giving the number of the tags as indicated below," the former in the upper left hand corner in large type, and the latter at right angles thereto across the left end, and in ten point type. The envelopes are to be stenciled with the same number that tags enclosed in said envelope bear. The tags so enclosed as above to be delivered packed in substantial crates, each crate to contain 50 sets of tags consecutively numbered and properly packed in numerical order. On the packing sheet used between the tags in each envelope there shall be printed instructions to owners the copy for which is to be supplied by the Secretary of State.

Tags shall be delivered F. O. B. Capitol Building, at Bismarck, as follows:

Two thousand (2,000) automobile and five hundred (500) motorcycle tags, not later than December 10th, 1914.

Five thousand (5,000) automobile and five hundred (500) motorcycle tags, in addition to previous delivery, not later than January 10th, 1915.

Five thousand (5,000) automobile and five hundred (500) motorcycle tags, in addition to previous deliveries, not later than February 10th, 1915.

Balance of tags to be delivered not later than March 10th, 1915.

Payment for tags to be made as follows:

For first shipment on February 1st, 1915; for second shipment on March 10th, 1915; for third shipment on April 20th, 1915, and balance to be paid on or before July 1st, 1915. Payment in all cases may be anticipated by the Secretary of State.

All tags ordered by the Secretary of State, except those for which a definite date of delivery is herein specified, shall be delivered at such time and in such quantities as the Secretary of State may direct.

The right to purchase tags in the open market is hereby specifically reserved. Such right may be exercised in event of failure upon the part of contractor to furnish the necessary number of tags as and when ordered, the difference in cost of such tags and necessary expense incident to securing them, to be charged to contractor, and such amount may be deducted from any amount then due the said contractor or recovered under his bond.

All tags must be finished in a thorough and workmanlike manner and the right is reserved to reject any tags for defective material or workmanship. The contractor must agree to refinish or replace without expense any tags that fail under ordinary usage during the term of the contract.

Bidders are required to furnish samples of work and to specify in detail the metal and the coats of enamel to be used. The weight of the complete tag, including the envelope, must in all cases be given.

Each bidder is requested to name price per pair for tags specified and also price per pair for additional tags and duplicate tags.

Each bid must be accompanied with a certified check in the sum of $100.00 made payable to Thomas Hall, Secretary of State, as a guarantee that the bidder will carry out the terms and conditions of the contract if same is awarded to him.

The right to reject any and all bids is hereby reserved. All bids must be sealed and marked, "Bid for furnishing motor vehicle tags" and addressed to

THOMAS HALL
Secretary of State, Bismarck, N. D.

IF YOU TRY ONE YOU WILL WANT MORE
Critchley's Expanding Reamer

Reams Odd-Sized Holes

CHADWICK & TREFETHEN, PORTSMOUTH, N. H.

SUPPLIES

Dealers, send for our 1914 catalogue, just out. New goods, new prices, prompt shipments. A few Fisk casings, 36x4, Q. D. Clincher Heavy Car Type, at reduced prices, while they last.

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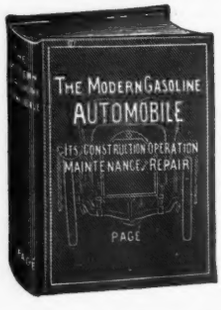
1355 S. Michigan Blvd., Chicago, Ill.

Hoyt Electrical Instrument Works
Makers of
HOYT AMMETERS AND VOLTMETERS
Penacook, New Hampshire

BOILERS

FOR STANLEY STEAM CARS. Also Grout, Prescott, Locomobile and Mobile Boilers, all guaranteed to fit. Special boilers 4 to 60 h. p.; repair work.

Steam Carriage Boiler Co., Oswego, N. Y.



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The Modern Gasoline Automobile

Its Construction, Operation, Maintenance and Repair

By VICTOR W. PAGE, M. E.

Over 800 Pages *ELEVEN LARGE FOLDING PLATES* *575 Illustrations*

PRICE $2.50—Covers Every Phase of Modern Automobile Practice

This book will explain the very latest developments in motor cars to you, including electric lighting and starting systems, two-speed, rear drive axle, kerosene carburetors, etc.

Not too Technical for the Layman—Not too Elementary for the More Expert

THE CLASS JOURNAL COMPANY 910 South Michigan Avenue, Chicago, Illinois

51

Classified Advertising

Rate 25¢ a Line

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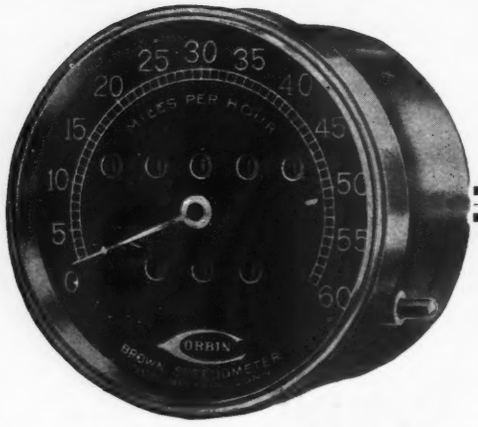

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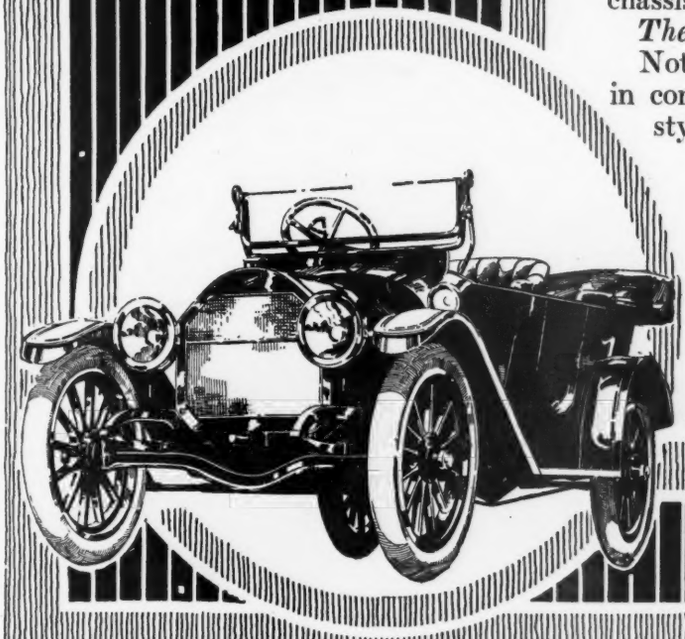

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